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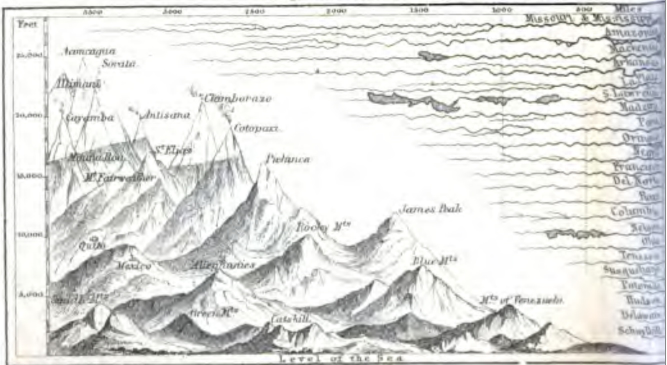

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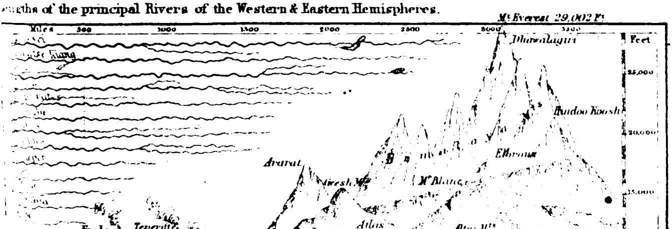
EASTERN HEMISPHERE

...ngths of the principal Rivers of the Western & Eastern Hemispheres.



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GEOGRAPHY GENERALIZED;

OR,

AN INTRODUCTION

TO THE

STUDY OF GEOGRAPHY

ON THE PRINCIPLES OF

CLASSIFICATION AND COMPARISON,

WITH MAPS AND ILLUSTRATIONS;

AND

INTRODUCTIONS

TO

ASTRONOMY, HISTORY, AND GEOLOGY.

BY

ROBERT SULLIVAN, LL.D., T.C.D.,

BARRISTER-AT-LAW, &c.

TWENTY-NINTH EDITION, REVISED, ENLARGED, AND IMPROVED.

DUBLIN:

MARCUS AND JOHN SULLIVAN,

27, MARLBOROUGH-STREET.

LONGMAN, GREEN, LONGMAN, AND ROBERTS, LONDON;

JOHN MENZIES, EDINBURGH.

1862.

Printed by ALEXANDER THOM, 87, Abbey-street, Dublin.

PREFACE.

FIRST EDITION.

THIS little work is, as its title imports, an INTRODUCTION to the study of GEOGRAPHY. It will, however, be found to contain much more information upon this important and interesting branch of education than is usually met with in much larger volumes. This is entirely owing to the PLAN upon which it has been drawn up. Instead of dividing the attention, and oppressing the memory of the young student, by obliging him to learn and recollect the unconnected facts and innumerable details with which this, the most extensive of all the sciences, abounds, the essential facts and leading principles have been presented to his view under general and separate heads. In this way, he learns with ease, and recollects without effort, the general and fundamental principles of the science; and having thus fixed in his mind a clear and connected outline of the whole subject, he will be able to fill it up as he proceeds, not only without difficulty, but with pleasure.

As the PLAN of this work, and the advantages resulting from it, are fully developed in the ARTICLE headed "METHOD OF TEACHING GEOGRAPHY," page 149, the reader is respectfully requested to peruse it before he proceeds farther. To the Teacher of Geography this article is especially recommended. In fact, it is to him the most important part of the work.

It may appear strange that so large a portion of so small a treatise should be devoted to the mathematical part of Geography; but as the writer is convinced, that there can be no *rational*, and therefore no real knowledge of Geography, without clear and correct ideas of the FORM, MAGNITUDE, and MOTIONS of the earth, he determined to meet these difficulties in the outset, and to do every thing in his power not only to make them intelligible, but also easy and interesting to the youthful intellect.

Besides, the INTELLECTUAL method of teaching, now happily introduced into every good school in the country, requires the pupils to have a *rational* knowledge of every thing in which they are instructed. Formerly, the great

majority of them knew little more of the sphericity of the earth, than that it was "round like a ball or an orange;" but now something more is required, both of the teacher and the pupils, than the twirling of a globe, the copying of maps, and the learning by rote from books the mere names of places.

The QUESTIONS FOR EXAMINATION will save the teacher much time and trouble. They will also materially assist the pupils in the preparation of their lessons, by enabling them to interrogate themselves and each other on the text before they go up to be examined by the master. The teacher will not, of course, confine himself to these questions; nor should he require his pupils to answer them in the words of the book. This would be to go back to the old and absurd method of teaching Geography by rote. A satisfactory answer in suitable language is all that the teacher should require; and if the pupil answers in his own language, so much the better.

A very useful exercise for the advanced classes will be, to assign a few of these questions to be *answered in writing.* In this case they should be allowed a few minutes to read over the page to which the questions refer; and *then having closed their books*, to give a suitable answer in writing to each question in order. With this view the questions have been paged and numbered. There can be no more useful exercise than this, as it enables the teacher to give lessons in Geography, Writing, Spelling, Grammar, and COMPOSITION, to large numbers of pupils at the same time.

TWENTY-SEVENTH EDITION.

*** *In order to make this little work still more deserving of its popularity as a School Book, not only in this country, but also in Great Britain and the Colonies, the Author has revised, enlarged, and—he hopes—greatly improved the present edition. He has also appended to the Geography of every country in Europe a sketch of its History, which, though necessarily short, will be found to be of great use to the young student. Besides the information which these sketches contain regarding each country, they will give him a clear and connected idea of the general history of Europe.*

DUBLIN, JANUARY, 1861.

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INTRODUCTION TO GEOGRAPHY.

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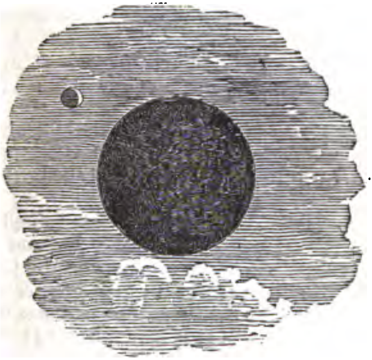
FORM OF THE EARTH.



GEOGRAPHY, which, generally speaking, means a *description of the earth*, may be divided into three branches—namely, Mathematical, Physical, and Political.

MATHEMATICAL Geography, which treats of the form, motions, and magnitude of the earth, is connected with the sciences of Mathematics and Astronomy.

PHYSICAL Geography treats of the great natural divisions of the earth's surface; its material and structure; its various

productions, animal and vegetable; its atmosphere, climates, and other particulars respecting its *physical* or natural condition. This branch of Geography is connected with Natural History and Natural Philosophy.

POLITICAL Geography treats of the divisions of the earth into states and empires, with their extent, population, and resources; forms of government, laws, religions, customs, manners, learning, and other matters which pertain to man, as a *political* or social being. This branch of Geography is, consequently, connected with History and Political Economy.

The FORM of the earth is *globular*—that is, like a GLOBE or ball.[a]

A teacher will be able to give his pupils a familiar, and tolerably correct idea of the form of the earth by directing their attention to the shape of an orange. After holding it up to their view, let him ask them if it is perfectly round like a globe or ball, and they will soon discover that it is a little flattened at the *top* and *bottom*. And so, it may be observed, the curved surface of the earth is a little flattened at the *top* and *bottom*;[b] but not nearly so much in proportion to its size as an ORANGE.

Pass a knitting needle, or a piece of straight wire, through the centre of an orange, from the stem to the point opposite, and make it turn round upon it. This will exemplify the AXIS and DIURNAL motion of the earth.

The earth's surface, except where interrupted by elevations and declivities, *appears* to be flat, and not curved or globular; but this appearance is occasioned by the immense size of the earth. To a small insect, as a fly, creeping over an artificial globe its surface must appear flat, though we know that it is perfectly round or spherical; and so the surface of the earth appears to our bounded view. The tallest man, standing in the middle of the most extensive

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[a] A GLOBE or SPHERE is a perfectly round body like a ball or marble. A SPHEROID differs from a perfect sphere by being either *flattened* about the top and bottom, like an ORANGE, or *elongated* like a LEMON. The former is called an *oblate*, and the latter a *prolate* spheroid. The word spheroid means *like*, or nearly *a sphere*.—See page 43.

[b] That is, about the POLES. The earth differs so little from a perfect sphere, compared with its great magnitude, that in any representation which we could make of it, the difference would be too small for perception. Hence, even the largest artificial globes are made perfectly round.

plain, cannot see the *surface*[a] of the earth farther than three miles round him. But a circle on the earth's surface six miles in diameter is far less in proportion than a circle the size of a small wafer on the surface of an artificial globe. But such a circle, or even a much larger one, if cut out of the surface of an artificial globe, and laid upon the floor or a table, would appear to us to be *flat*, though we know that it is really *globular*, because it forms part of the surface of a globe. Nor do the mountains, or the other inequalities observable on the earth's surface, affect its general sphericity. If we examine the surface of an orange, we shall find it full of little inequalities, the least of which is greater, in proportion to the size of the orange, than the highest mountain on the earth's surface is to the magnitude of the earth.[b] In fact, the smallest grain of sand on the surface of an artificial globe, twelve inches in diameter, would be larger, in proportion to such a globe, than the highest mountain on the surface of the earth would be to the great globe of the earth. But oranges appear round and smooth notwithstanding the

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[a] The earth's surface curves or slopes about eight inches in a mile, and this curvature increases with the square of the distance. Thus, in two miles the curvature is 4 times 8, or 32 inches; in three miles, 9 times 8, or 72 inches; and so on, as the square of the distance. The eye of a man six feet high is not elevated 72 inches, or 6 feet above the surface, and therefore, in the position in which we have supposed him, he cannot see the *surface* three miles around him. Of course, he could see, at a much greater distance, objects that rise *above* the surface; as houses, trees, and mountains.

For a similar reason, a small portion of the circumference of a circle, if seen or viewed by itself, appears to form part of a *straight* line. It is only when a considerable portion of the circumference is seen that the *curvature* begins to appear.

[b] To represent in *relief*, and in relative proportions, the highest mountain in the world on the surface of an artificial globe twelve inches in diameter, we would require a grain of sand the 130th part of an inch in thickness—in fact, an almost imperceptible atom. For five miles, the height of, perhaps, the highest mountain in the world, is only about a 1600th part of the earth's diameter; and the 1600th of the diameter of a 12-inch globe is only about the 130th part of an inch.

On the surface of a large pincushion, in the form of a ball, the heads of the smallest pins that are made would be quite too large to represent the size of the highest mountains on the earth's surface, *as compared with the great globe itself.* And if the surface of such a pincushion were covered over with small pins, stuck up to the head, it would, if viewed from some distance, *appear* to be perfectly smooth or free from inequalities.

inequalities on their surface; and so would the earth, if we could see the half of it at one view, as we see the orange.

That the earth is a globe or sphere has been often proved *practically*. Several navigators have actually sailed round the world—that is, they have, by continuing their course to the *westward*, returned by the *eastward* to the place from which they set out, and *vice versâ;* just as we may have seen a fly creeping down one side of an artificial globe and up the other.

MAGELLAN was the first person who *circumnavigated* the earth; but COLUMBUS first attempted it, and to him, consequently, the chief credit is due. Columbus, convinced in his own mind of the sphericity of the earth, concluded that he could reach the *East* Indies by continuing his course to the *westward;* and this he would have accomplished, had not the world of which he was the discoverer intervened.

We shall now state briefly the arguments which led Columbus, and others long before his time, to conclude that the earth was a sphere or globe.

If the earth be a plain surface, extending out to the skies, as it *appears to be*, and as the uneducated still think it is, the sun and the other heavenly bodies would, when they rise above the horizon, be visible all over the world at the same time. But we know that this is not the case. To persons living to the *eastward*, the sun appears sooner than to persons living to the *west;* and we know that when the sun disappears below our horizon, he rises to countries *west* of us.[a] This is occasioned by the *curved* or *convex* form of the earth's surface; just as a mountain, interposed between us and the rising or setting sun, intercepts him from our view.

It was this circumstance that first led the philosophers of antiquity to conclude that the earth was a *spherical* or round body. In proportion as they travelled *eastward* or *westward*, they observed that the sun rose sooner in the one case, and later in the other. They concluded, therefore, that the earth's surface, at least from *east* to *west*, must be *globular*. But they likewise observed that if they proceeded *northward* or *southward*, the POLAR STAR appeared to ascend or descend in proportion to the space passed over; and that while *new*

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[a] Hence the time of day, as measured by the sun, can never be the same in places *eastward* or *westward* of each other.

stars appeared above, others, with whose appearance they had been long familiar, sank below the horizon. They, therefore, concluded that the surface of the earth from *north* to *south* also was *globular*; and as similar appearances were observed in every direction, they finally came to the conclusion that the earth was an immense SPHERE or globe.[a]

Other and more familiar proofs of the earth's sphericity may be added. As a vessel recedes from the land, the spectators on shore lose sight first of the hull, next of the lower sails, and finally only the tops of the masts are perceptible. This is evidently not the effect of *distance*; for, if so, the masts, which are *smaller* than the hull or body of the ship, would first disappear. It is occasioned by the *convex* or globular surface of the sea, which rises up between the ship and the spectators. This they may easily prove; for if they immediately ascend a tower or eminence, the vessel will again be visible. Similar appearances present themselves to the persons on board the vessel; first the shore begins to sink, next the buildings, next the tops of spires and mountains only are perceptible, and finally they lose sight of land. It is under these circumstances that—

> "The sailor sighs as sinks his native shore,
> And *climbs the mast* to feast his eyes once more."

Similar appearances are observed in every part of the earth, and in every direction. Towers and mountains, as we recede from them, seem to sink below the horizon, their *bases* disappearing first, next their middle parts, and finally their summits. And in every sea in the world, and in every direction, the most extended view is had from the *mast-head* of the vessel; and hence sailors always go aloft when they are on the look-out for land, or for any other object which they may wish to seek or shun.

It may now be added, that the earth could be nothing else than a *sphere*, in accordance with its motions as a PLANET, of which we shall presently speak; and even the cause of its sphericity may be shown.

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[a] In eclipses of the moon, the shadow of the earth is always *circular*, which is another proof of its sphericity. The shadow cast by a round body, like a plate on the wall of a lighted room, is *circular* only when the *back* or *front* of it is turned towards the wall; but, in such a position, a ball or globe, if turned round, *always* casts a circular shadow.

We know that every particle of matter attracts and is mutually attracted by every other particle of matter which comes within the sphere of its influence; and consequently, that the greater the quantity of matter, the greater will be the attractive power. Hence the several kinds of attraction, which are all modifications of the same principle:— 1. COHESION, or *the mutual attraction* of minute particles of matter of the same kind in contact with each other. 2. GRAVITATION, or that power which causes bodies to attract each other in proportion to the quantity of matter which they contain, and inversely as the square of their distance. 3. MAGNETISM, or that property in the *magnet* or loadstone which *attracts* iron. 4. ELECTRICITY,[a] which is exemplified by the *attraction* of feathers, or light substances suspended near the electrical conductor.

It is the attraction of *cohesion* which causes the particles of matter of which bodies are composed to *cohere* or stick together. Without it, all the bodies in the universe would fall into pieces, or rather crumble into indivisible particles or ATOMS. It was this property, originally impressed upon matter by the hand of the Creator, which caused the earth, the planets, and all the heavenly bodies to assume, and still enables them to retain their *globular* forms. One of our poets has beautifully and truly said—

"That very law which moulds a tear,
And bids it trickle from its source—
That law preserves the earth a sphere,
And guides the planets in their course;"

for the same principle is exemplified in the dew-DROPS which hang from the thorn, and in the rain-DROPS which fall from the clouds. The minute vapoury particles of which DEW and RAIN are composed, by coming into contact, mutually attract each other, and form into DROPS or small globes.

The numerous globules into which a small quantity of quicksilver forms, when it falls upon a table or the floor, exemplify the same principle. The particles which come into contact attract, and are attracted by each other, mutually,

[a] *Electricity*—From *electron*, the Greek word for amber, in which this property was first observed. The term *electron* was applied to other *shining* substances, as to a mixture, four parts gold, and one part silver. The root is *helios*, the sun, as in peri*helion*.

on all sides, and hence the globular form is assumed.[a] And, as from the nature or form of a globe there is more matter in the direction of its centre than in any other, the general attraction of all the constituent particles or parts will be towards the centre.

Apply this to the original formation of the great globe which we inhabit. "In the beginning" it was "without form and void;" but when destined for the abode of man, its elements were reduced to order by the Creative Word; and from a *chaotic* and *homogeneous* state, it assumed, in consequence of the mutual and general attraction of all its constituent particles, the form of a GLOBE. And here it may be observed, that this was the only form which the earth could assume consistent with its position in pure space, and the *rotatory* motion which, for the benefit of mankind, it was destined to perform. For, suppose a round body like the earth were placed in pure space, remote from the attractive influence of any other body, it is easy to conceive that it would, self-balanced and self-supported, remain in the same position for ever. It would neither move *down*, nor up, nor backwards, nor forwards, nor in any direction whatever; for we have supposed that there are no other bodies to *attract* or draw it towards them. In fact, such a body, in such a position, would be without weight or gravity; for all its parts, on every side, would be attracted towards its centre or middle point,[b] and an EQUILIBRIUM would be produced.

The CENTRE OF GRAVITY of a body is that point on which the whole *weight* is, as it were, *concentrated* or balanced; and if the body be a globe of uniform density, it is evident from what has been said, that the centre of gravity will coincide with the centre or middle point of the globe. In this way, all the parts of the earth, on every side, are attracted towards its centre or middle point; and so is every thing, and every person on its surface; and there is not the least danger

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[a] The same principle is exemplified in the manufacture of shot. "If the small shot which is used by sportsmen were cast in a mould, the price would be enormous; but by pouring the melted lead of which the shot is made, through a cullender placed at the top of a tower high enough for the lead to cool in its passage through the air before it reaches the ground, the shot is formed in a *spherical* or round shape, by the mere act of passing through the atmosphere."—*Results of Machinery.*

[b] On the supposition that the density of the entire body is uniform.

of our falling from it, though our feet are often up, and our heads down, like flies on the ceiling. But the fact is, our feet are always *down* and our heads *up*; for these terms properly refer to the *centre* and *surface* of the earth. The *middle* point of a globe is the *lowest*, and *down* consequently means in the direction of the *centre;* and *up* means from the centre towards the *surface;* and it is in this way we use these terms with regard to the *earth*. But with regard to the heavens, the direction expressed by these terms is constantly changing. What we call *up*, during the day, we call *down*, during the night. Our ANTIPODES,[a] therefore—that is, the inhabitants of the earth who live on the opposite side of it, and consequently have their *feet opposite* to ours—are in no more danger of falling off than we are ourselves. They have, like all the inhabitants of the globe, the earth beneath their feet, and the heavens above their heads.

CHAPTER II.

MOTIONS OF THE EARTH.

IF you hold a small globe or ball before a candle, you will observe that the *one-half*[b] of it will be *illuminated* and the other half *shaded;* and if you make the ball spin or turn round, you will see that half of it will be in the light, and half in the shade, in succession.

Now this is an exact representation of the DIURNAL or daily motion of the earth. The earth is a *globe*, and as it turns round and round before the sun, the *one-half* of it is *enlightened* by his rays, and the other half deprived of his light, in succession. With the *half* turned *towards* the sun, it is *day*, and with the half turned from the sun, it is *night*. And as the earth is twenty-four hours[c] in turning once

[a] *Antip'ŏdes*—From the Greek word ANTI, *opposite*, and PŎDES, the *feet*. Places that are the antipodes of each other are equally distant from the equator, but in different hemispheres; and as they are on opposite sides of the globe, their meridians are as far as they can be apart, that is 180°.

[b] This arises from the nature or form of a globe. When a cube, or any other solid figure, is presented to a luminous body, only one of its sides is enlightened.

[c] Accurately, 23 hours, 56 minutes, and 4 seconds.

round before the sun, the length of the day and night taken together is twenty-four hours.

If you pass a piece of *straight* wire through the middle of an orange, from the *stem* to the *point opposite*, and make the orange turn round and round upon the wire, you will have a representation of the AXIS, POLES, and DIURNAL MOTION of the earth. For, as the orange may be made to turn on the wire like a wheel on its *axle*, so the earth turns round an imaginary straight line passing through its centre, from the north to the south points of its surface. This line is called the AXIS of the earth, and its extreme points or ends, the POLES:[a] the upper,[b] the NORTH pole, because it always points in the direction of the *north* pole of the heavens; and the lower, the SOUTH pole, for a similar reason.

In turning the orange round the wire, you will observe that every point on its surface moves round and round, except the points in which the wire terminates; and hence these points are called *poles*, because the earth *turns* round and round them, while they continue at rest. A top in motion, or a ball made to spin upon a table, may be given as additional illustrations of the earth's motion round its axis and poles. In this case, the uppermost and lowest points of the surface represent the POLES; and an imaginary straight line from one of these *points* to the other, through the centre, is called the AXIS.

The *rotation* of the earth on its axis in twenty-four hours from *west* to *east*, gives the sun and all the heavenly bodies the *appearance* of revolving in the contrary direction, that is, from *east* to *west*, in the same time; just as you may have observed, while travelling in a carriage or sailing in a boat, that the trees, houses, and other fixed objects, *appeared* to move past you in the opposite direction, while you fancied yourself to be at rest. If the motion of the carriage or boat in which you are supposed to be placed were perfectly *smooth* and *steady*, the more strongly would these appearances pre-

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[a] *Pole*—From a Greek word signifying to *turn*; whence also *pulley*, on which the rope *turns*. Most children confound this term with *pole*, a long rod or staff. The idea of the *axis* naturally leads them to make this mistake.

[b] The *north* was called *upper*, because the early astronomers, like ourselves, lived in the northern hemisphere, and consequently, the north pole appeared to them to be the uppermost.

sent themselves, and the less conscious would you be of your own motion. To persons ascending in balloons, it is said that the earth *appears* to sink beneath the balloon, instead of the balloon appearing to rise above the earth.

In this way, while the earth turns round its axis with a *perfectly* smooth and uniform motion, the sun, and all the heavenly bodies, *appear* to us to move in the opposite direction, while the earth appears to be fixed and immovable.

The same *phenomena* or appearances would be produced if, as was formerly believed, and as the uneducated still think, the sun and all the heavenly bodies revolve round the earth from east to west in twenty-four hours, while the earth itself continues at rest in the centre; but such a supposition is inconsistent with that sublime simplicity which characterizes all the works of the Great Author of Nature. The vicissitudes of DAY and NIGHT, so essential to the enjoyment and relaxation of man, are produced by one of two causes: either the earth turns upon its axis in twenty-four hours, presenting every part of its surface in succession to the sun, or the sun revolves round the earth in the same period of time. No third opinion can be formed on the subject. If the second supposition is correct, then must the sun every twenty-four hours describe a circle of nearly 600[a] millions of miles in circumference! For the distance of the sun from the earth would be the semi-diameter of the circle which the sun, on the supposition of his revolving round the earth, would have to describe every day—and this distance is known to be 95[b] millions of miles. But this motion, inconceivable as it is, would be nothing compared to the velocity with which the FIXED STARS would have to revolve; for if the earth does not turn on its axis, then not only the sun, but the ENTIRE UNIVERSE must move round it in twenty-four hours! Now words cannot express, nor imagination conceive, the number of the fixed stars. To Dr. Herschel, looking through his celebrated telescope in the direction of the milky way, they appeared—to use his own language—"scattered in millions like glittering dust;" and their distances from our globe are equally astounding. *Light* which

[a] The circumference of a circle is something more than three times the diameter, and, of course, more than six times the semi-diameter.

[b] The sun is more than a million of times larger than the earth, and there is every reason to suppose that each of the fixed stars is a sun!

travels from the sun to the earth in eight minutes—that is, *ninety-five millions of miles in eight minutes*—would, it has been computed, be more than three years in coming to us from the *nearest* fixed star!

Are we to conclude, then, that the sun, and millions upon millions of stars, scattered at all possible distances in the heavens, above, beneath, and around us, revolve round the earth in twenty-four hours, as they *appear* to do; or that the same effect is produced by a simple rotation of the earth on its axis in the same time? The result, as we have observed before, would, in either case, be the same: but in the one, the means employed would be simple and natural: in the other, complicated, and to our conceptions impossible. We have said nothing of the surpassing magnitudes of the sun and stars[a] compared to that of the earth, and the consequent absurdity of supposing that *innumerable* large bodies revolve round our globe, which is a mere point when compared to any one of them.

ANNUAL MOTION.

DAY and NIGHT, as we have seen, are produced by the rotation of the earth on its axis from *west* to *east* every twenty-four hours. We have now to explain the vicissitudes of the SEASONS. Besides the motion of the earth upon its axis every twenty-four hours, it moves round the sun in the course of a year, in a path nearly circular. The circumference of the circle which the earth describes in moving round the sun is called the earth's ORBIT, and the *plain* level surface included within, or circumscribed by the orbit, is called the PLANE of the earth's orbit. The word *orbit* means a *circular* track or path; and the term *plane*, a level or *plain* surface. The *circular* edge of a round table may represent the *orbit* of the earth, and the *surface* of the table its *plane*. Not that we are to suppose that the orbit of the earth is a solid or substantial ring, or its plane a real, visible, flat surface; for the earth and all the planets perform their revolutions round the sun, with unerring regularity, in pure and pathless space.

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[a] Of the magnitude of the fixed stars nothing is known, except by inference that they are *the suns* of other systems. Such is their amazing distance, that even when viewed through the most powerful telescopes, they appear, as they do to the naked eye, mere luminous points, their brilliancy only being increased.

To illustrate what has been said, carry a small globe or ball round a candle in a *circular* direction, and make it turn, at the same time, round and round, as if upon an axis. These motions given to the ball represent the *diurnal* and *annual* motions of the earth. The *circumference* of the circle described by the *centre* of the ball in moving round the candle, represents the earth's *orbit*, and the space which the orbit circumscribes or includes, its *plane*. The *plane*, as the term denotes, is in a *level* or line with the orbit, that is, neither rising above nor sinking below it.

The poles are the extreme *northern* and *southern* points of the earth's surface; and if we make the ball spin round, you will observe that the part of it which has the greatest motion is exactly *midway* between, or *equally* distant from the poles. Round this part draw a line or circle, and you will have a representation of the *equator*, which is so called, because it is *equally* distant from each pole. The equator runs east and west, and divides the globe into the NORTHERN and SOUTHERN HEMISPHERES or *half globes*.

Let the small globe or ball, with the poles and the equator marked upon it, be carried round the candle in an erect position, that is, with its axis perpendicular to the plane of its orbit, and it will be evident that the candle will shine *directly* on the middle or equatorial parts of the ball, and *obliquely* on the parts in the direction of, and about the poles.

Now, if the earth moved round the sun in this way, that is, with its axis perpendicular to the plane of its orbit, it is easy to conceive that the sun would shine *directly* on the middle or equatorial parts of it, and *obliquely* on those parts in the direction of, and about the poles. But if this were the case, there would be no *seasons*, and consequently, neither animal nor vegetable life in the world. The middle or equatorial parts of the earth would be parched and burned up by their constant exposure to the direct rays of the sun; in the temperate zones, which now enjoy the pleasing vicissitudes of the seasons, there would be perpetual spring—but without the hope of a harvest—while in the polar regions, the rigours of winter would continue unbroken throughout the year.

But the earth does not, as *we* would think it should, move round the sun in an upright position, but in a *slanting* direction. The axis, instead of being *perpendicular* to the plane of its orbit, *inclines* or leans to it at an angle of 66½ degrees;

and as it always points to the same part of the heavens, the northern half of the axis, and consequently the *northern hemisphere*, will, during one period of the year, *incline to*, and at another *decline from* the sun. When the *northern* half of the axis of the earth is *inclined to*, the *southern* will, of course, be *declined from* the sun; and hence, when it is SUMMER in the northern, it will be WINTER in the southern hemisphere, and *vice versâ*. During two periods of the year the axis of the earth neither inclines to, nor declines from the sun, and the consequence is, that it is neither summer nor winter in either hemisphere. At these periods both hemispheres enjoy an equal degree of light and heat from the sun, and they are called the EQUINOXES—because the *night* and, of course, day are *equal* all over the world.

To illustrate what has been said—for descriptions, and even diagrams, fail to produce clearness in the minds of children in such matters—let the instructor carry a *straight* rod or ruler round the edge of a circular table, and let one half of the ruler be above, and the other below the edge of the table. If the ruler is carried round in an *erect* position, it will be evident to the pupils that it is *perpendicular* to the surface or *plane* of the table, and also that it moves *parallel to itself*, or to the direction in which it was when it commenced to be carried round. But if the ruler be inclined towards the table at an angle of 66½ degrees, and made to preserve its parallelism as it is moved round, it will represent the angle made by the axis of the earth with the plane of its orbit, and its inclination towards the sun throughout the year.

As a farther illustration, let the small globe, upon which we marked the poles and equator, be carried round a candle supposed to represent the sun, *in the same way as the ruler has been moved round the table*, and the causes of the SEASONS will be evident.

[The following familiar illustrations will enable young persons to form clear and correct conceptions of the causes which produce the SEASONS:—

When we sit opposite to a fire, though at a considerable distance from it, we feel the heat more than if we sat close beside it. If the fire is on the floor, or nearly on a level with it, our feet, if sitting near it, will be very warm, while the upper part of our persons may feel cold; but if the fire is raised, say as high as our heads, the heat thrown upon our faces, particularly if we sit opposite to it, will be intolerable; while our feet may not even be warm.

If you stand opposite to a fire which is about half your height from the floor, it is obvious that the middle part of your person would receive the greatest amount of heat. And if this fire were in the middle of a large room or hall, so that you could walk round it, always keeping the same distance from it, and with your face towards it, would there be any change as to the parts of your person which would receive the greatest amount of heat? But, if in going round it in a circle, you keep turning round and round at the same time, what would be the effect? Yes; you are right, the middle part of your person would receive the greatest amount of light and heat, and the upper and lower parts the least. If you could move round it in a slanting direction, so that the upper part of your person would be inclined towards the fire, and the lower part declined from it, what would be the result? You are right; the upper part of your person would receive a greater, and the lower a less degree of heat; and this you will see clearly if you carry, in this position, a small figure, as a child's doll, round a candle placed in the middle of a circular table. And if in carrying the little figure round as before, you make the upper part of it decline from the candle, and the lower part incline to it, the result will be the reverse, that is, the upper part of it will receive less of the light and heat than the lower.

Now, if the earth moved round the sun in any of the ways we have described, there would be NO SEASONS; for the same parts of its surface would always receive the same amount of light and heat. And how does the earth move round the sun? Now mark the answer to this question, for it contains the whole doctrine of the seasons—THE AXIS OF THE EARTH IS INCLINED TO THE PLANE OF ITS ORBIT; AND IT MOVES ROUND THE SUN IN A DIRECTION PARALLEL TO ITSELF. And this is the only way it could move, for it has no power to keep changing the direction of its axis, as you kept turning and twisting the small figure in carrying it round the candle, so that its head pointed in every direction—*north*, *south*, *east*, and *west*.

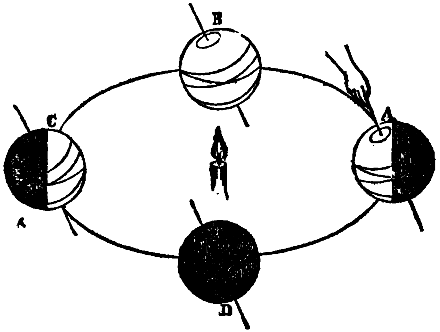
Now, carry the small figure round the candle in a direction *parallel to itself*, and observe the different effects. If you stand on the *south* side of the table, and incline the upper part of the figure towards the candle, its head will point *northward* of the point of the ceiling which is directly above the candle. This represents the position of the earth with regard to the sun at MIDSUMMER. When you carry it a quarter way round, with its head still pointing in the same direction, that is, *northward*, you will observe that neither the upper, nor the lower part of the figure is inclined to, or declined from the candle; and that consequently neither of them receives a greater amount of light and heat than the other. In this position, the middle of the figure is directly opposite the middle of the flame of the candle; and that part of its surface is consequently the warmest. This is an illustration of the AUTUMNAL EQUINOX.

Now carry the small figure round another quarter of the circle

keeping its head in the same direction, that is, *northward*, and you will observe that the upper part of it is now declined from, and the lower part inclined to the candle. This represents the position of the earth with regard to the sun in the WINTER of our year. And if you carry it round a third quarter of the circle, with its head pointing in the same direction as before, that is, *northward*, you will see that neither the upper nor the lower part of it inclines to, or declines from the candle. This represents the VERNAL EQUINOX. Now carry it round the remaining quarter of the circle as before, and you will observe that the upper part of it is again inclined towards the candle, and the lower part declined from it; or, in other words, we shall have a representation of our SUMMER again.

And you will also observe that, in carrying the small figure round the candle, you made it move in the same PLANE; that is, you neither *raised* it nor *lowered* it so as to bring at one time the parts *above* the middle, and at another time, the parts *below* it, directly opposite the middle of the flame of the candle. In this way, the earth neither *rising* nor *sinking* in its course (*which it could not do*) presents at one period, that part of its surface which is 23½ degrees *above* the equator to the direct rays of the sun; at another, the *equator;* at another, that part of its surface which is 23½ degrees *below* the equator; at another, the *equator* again; and so on.]

In the following diagram, the position of the earth with regard to the sun at midsummer, midwinter, and the equinoxes, is represented.



At A, the northern half of the axis is inclined to the sun, and the northern hemisphere, in consequence, enjoys much

more of his rays than the southern. In this position of the earth, the sun shines *perpendicularly* over the TROPIC OF CANCER, and consequently 23½ degrees over and beyond the *north* pole; for as the earth is a *globe*, the sun shines over the *one half* of it, or in other words, over ninety degrees in every direction, from the point over which his rays are perpendicular. In this case, the entire of the *north* FRIGID ZONE will be within the *illuminated* hemisphere, and it will be constant day there while the earth remains in this position with regard to the sun. It is obvious, too, that in this case the rays of the sun will fall short of the south pole by 23½ degrees, and that, consequently, the entire *south* FRIGID ZONE will be deprived of his light while the earth continues in this position with regard to the sun.

Suppose the earth to have moved to B, and observe that its axis is neither inclined to, nor declined from the sun. In this case, the sun is perpendicular to the equator, and consequently shines ninety degrees above and below it, or, in other words, from pole to pole. In this case too it is obvious, that the days and nights are equal all over the world; for not only the equator, but all the parallels of latitude are bisected or cut into two equal parts by the CIRCLE OF ILLUMINATION. By the *circle of illumination* is meant the circle which divides the hemisphere presented to the sun, from the hemisphere which is deprived of his light. And as this circle divides the globe into two equal parts, it is a GREAT CIRCLE;[a] and as all great circles bisect each other, it,

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[a] A GREAT circle of a globe or sphere is one which would divide it into two equal parts or HEMISPHERES; and it is so called because it is evidently the *greatest* that could be drawn upon it. The *equator* is a great circle; and so is each of the *meridians*—and so indeed are all circles that would divide the globe into two equal parts. And it is also evident that the PLANES of all great circles must pass through the centre of the earth. To show this clearly, cut a round apple through the middle from side to side, and this will illustrate the great circle of the equator, and its plane as passing through the centre. Take another, and cut it from top to bottom through the middle, and this will show that a meridian is also a great circle, and that its plane passes through the centre. Take a third apple, and from any point of its surface, cut it through the middle to the opposite point, and you will have a representation of another great circle, and its plane passing through the centre. Now, take a fourth apple and cut it, in a *circular* direction, into two *unequal* parts, and you will see that its plane does not pass through the centre. Such circles are called SMALL CIRCLES. In fact,

in every situation of the earth, divides the equator into two equal parts. It is this circumstance which causes the days and nights to be of equal length at the equator throughout the year. *One half* of it is within the *enlightened*, and the *other half* within the *darkened* hemisphere: and as the *entire* circle turns round in twenty-four hours, it is evident, that *each half* of it will turn round in twelve; or in other words, the days and nights will be of equal length.

The same explanation applies to all the circles parallel to the equator, or, as they are usually called, parallels of latitude. When the earth is in the position now described, they are all *bisected*, or divided into two equal parts by the circle of illumination; and the days and nights are consequently equal all over the world. But when the sun is *above* or *below* the equator, that is, north or south of it, all the parallels of latitude are *unequally* divided by the circle of illumination, and the days and nights are consequently of unequal length. When the sun is *north* of the equator, *more* than half of each of the parallels of latitude in the *northern* hemisphere is within the circle of illumination, and the days are consequently *longer* than the nights; and when the sun is *south* of the equator, the contrary is evidently the case.

In explaining to the pupils what is meant by the circle of illumination, the teacher should not trust entirely to the diagram. He will give them a clearer conception of it by holding a small globe before a candle in different positions, and by calling upon them, at every change, to point out its *boundary* and the *direction of its plane*, which, as it is a *great* circle, always passes through the centre of the earth. If the north pole or axis of a small globe, for example, is held opposite the candle in a straight line with the centre of the light, it will be evident that the entire northern hemisphere would be *within*, and the entire southern hemisphere *without* the circle of illumination; and that if the earth turned round in this way before the sun, it would be perpetual day in the one hemisphere, and perpetual night in the other. In this case it will be evident, that the boundary between the enlightened

even children know the difference between *great* and *small* circles; for if you promise a child the half of an orange or an apple, he will be on the watch to see that you are cutting it in the direction of a great circle, that is, fairly through the middle.

and shaded hemispheres, or in other words, the *circle of illumination*, will exactly coincide with the equator, and consequently that its plane will pass through the centre of the globe perpendicular, or at right angles to its axis. In this case, it is obvious that the plane of the circle of illumination would be perpendicular to a line drawn from the centre of the sun to the centre of the earth,[a] to which we suppose the sun's rays to be parallel; for in this position the *axis* represents that line; and it may be easily shown that it is always so, in every situation of the earth with regard to the sun.

If the pupils get a clear idea of what is meant by the circle of illumination, keeping in mind that the earth, in moving round the sun, has its axis inclined to its orbit at an angle of 66½ degrees, and that it always points to the same part of the heavens,[b] they will feel no difficulty in comprehending the causes of the seasons, or in determining the length and general temperature of the days, in every part of the earth, throughout the year.

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[a] For in this case, the plane of the circle of illumination coincides with the plane of the equator which is evidently at right angles to the axis of the earth.

[b] If you move round the edge of a *circular* table in the middle of a room, a line from the top of your head will appear to describe a corresponding and equal circle on the ceiling—and yet the north pole of the earth, though it describes, in the course of a year, a circle of 190 millions of miles in diameter, always points to the polar star! This arises from the amazing distance of the fixed stars, which causes, not only the earth, but the entire orbit in which it moves to appear as a mere point in comparison. The following illustration will make this clear:—If the circle formed on the floor by your moving round the table be six feet in diameter, the corresponding circle described on the ceiling will also be six feet in diameter, and its centre will, consequently, be three feet from every point of its circumference. Now, in walking round the circle on the floor your head will evidently point to the *circumference* of the circle on the ceiling, and not to the *centre* of it. But if the circle were painted *black*, so as to make it more distinctly seen, and if the ceiling on which it is described could be perpendicularly raised to an immense height, what effect would this have as to its appearance? You are right; it would appear to us to be much smaller; perhaps not larger than the *crown* of a man's hat. And if it were raised higher and higher, it would gradually diminish to the size of a *black* wafer; and finally, this circle, which we know to be six feet in diameter, would appear to us to be no larger than the head of a *black* pin. Now, if you walk round the circle as before, a line from the top of your head would, *in appearance*, always point to this speck, though you know it would really describe a circle six feet in diameter.

This may also be illustrated by drawing upon an elevation three

Let us take another view of our diagram, page 21. Here we have represented the position of the earth with regard to the sun on the 21st of June, the 22nd of September, the 21st of December, and the 20th of March—that is, during the summer and winter *solstices*, and the vernal and autumnal *equinoxes*; and in each position of the earth it is evident that its axis points in the same direction, moving, as is said, parallel to itself.

At A, or during the summer solstice, the sun is perpendicular to the TROPIC OF CANCER, or to that part of the earth's surface which is 23½ degrees *north* of the equator; and as he always shines over ninety degrees in every direction, from the point over which he is perpendicular, it is evident that his light will be diffused 23½ degrees over and beyond the *north* pole, while the same extent of surface round the *south* pole will be deprived of his rays. And hence, as in the diagram, the entire *Arctic* circle comes within, while the *Antarctic* lies without the circle of illumination; *and it is for this reason* that these circles are described 23½ degrees distant from each pole.

The earth proceeds in her course, and in three months after is in the position represented at B. Here the sun, which, in consequence of the *earth's motion* in her orbit, has been daily withdrawing his rays from about the north pole, is perpendicular to the equator—and the circle of illumination, consequently, extends from pole to pole.

At C in the diagram the winter solstice is represented. In this case the rays of the sun are perpendicular to the TROPIC OF CAPRICORN, and the circle of illumination consequently sweeps round the *south* pole, and 23½ degrees beyond it, leaving the north pole and 23½ degrees around it (that is, the entire north frigid zone) involved in darkness.

At D the earth has arrived at the vernal equinox, and the sun is again perpendicular to the equator, and the circle of illumination again extends from pole to pole.

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or four *parallel lines*, ten or fifteen feet from each other. If we look along them, they will *all* seem to point *directly* to the moon in the horizon, which, of course, is occasioned by the great distance of the moon from us; and, perhaps, the distance between the lines (10 or 15 feet) will bear as great a proportion to the distance of the moon from the earth (240,000 miles), as 190,000,000 of miles to the distance of the polar star.

But how do we know that the earth moves round the sun? Besides the sun's apparent diurnal motion from east to west, he appears, when closely observed,[a] to move nearly a degree, or about twice his own diameter, every day to the eastward, and thus, in the course of a year, to complete a great circle in the heavens. But his apparent diurnal motion has led us to doubt the evidence of our senses in these matters, and a little reflection will convince us that his annual motion also is merely apparent, and that the circle which he seems to describe in the heavens is really described by the earth in travelling round her orbit. In illustration of this, place a globe or candle on a table in the middle of a room, and move round it in a circle, keeping your eye upon it and the wall in a line with it. In this case the globe or candle, though fixed in the middle of the room, will appear to you, to describe a circle round the wall. And thus the sun, though at rest in the centre, appears to us to describe a circle round the heavens, which is really described by the earth in its orbit; the earth describing one part of the circle while the sun appears[b] to describe the opposite.

The circle which the sun thus appears to describe in the heavens among the fixed stars, is called the ECLIPTIC;[c] be-

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[a] If, by means of a telescope, or through the shaft of a very deep mine, the sun be observed in a line with a fixed star, the next day, at the same hour, he will appear to have moved nearly a degree, or about twice his own diameter to the *east* of such star; and in twenty-four hours more, another degree eastward, and so on, till having completed a great circle in the heavens, he returns in the course of a year, to the same fixed star. Observations to the same effect may be made on any clear evening after sunset. If a star be observed near the horizon to the eastward of the place where the sun appeared to set, the next evening, at the same time, it will appear nearer to the place where the sun disappeared, and on the next still nearer, and so on till it sets along with the sun, and is consequently lost in his rays.

[b] Thus, when the earth is in Libra, the sun appears to be in the opposite sign, Aries; and when the earth moves to Scorpio the sun seems to enter Taurus, and so on.

[c] *Ecliptic.*—As this circle was supposed to be described by the sun in 360 days, the ancient astronomers divided it into *three hundred and sixty* equal parts, which they called DEGREES to denote the (*steps*) progress made each day by the sun; and hence the division of the circumference of ALL CIRCLES, *great* and *small*, into *three hundred and sixty* equal parts or DEGREES. The ecliptic is also divided into twelve equal parts, containing thirty degrees each, to correspond to the *twelve* months of the year. These parts are called the SIGNS of the ZODIAC, because they are generally represented by the *signs* or figures of *animals*.

cause as it is in the same plane with the earth's orbit, an *eclipse*[a] will take place when the moon comes within it.

As an illustration of this, let the circle which your head, in moving round the globe just referred to, may be supposed to have described, represent the *orbit* of the earth, and let the circle apparently described by the globe round the walls of the room represent the *ecliptic*, and it will be evident that these circles have the same centre and lie in the same plane. Now hold up an orange or a ball in a line between your eye and the centre of the globe and you will have a representation of an *eclipse*. The *globe* is supposed to represent the sun, your *head* the earth, and the *orange* the moon; and, as they all lie in the same plane, it is evident that the orange will intercept a portion of the globe from your view. This is a representation[b] of an eclipse of the *sun;* and if you turn your back to the globe, keeping the orange in the same line with it and your head, you will have a representation of an eclipse of the *moon*—for in these cases, your head will *intercept* the light supposed to come from the globe to the orange. If you *raise* or *lower* your hand no eclipse will take place; because, in these cases the orange would be either *above* or *below* the plane of the ecliptic. And it is in this way that the moon generally moves, either a little above or a little below the plane of the earth's orbit, otherwise there would be two eclipses every month—one of the *sun* at new moon, and another of the *moon* at full moon.

The term ZODIAC, which is derived from a Greek word signifying *animal*, is applied to a broad circle or belt in the heavens, extending about eight degrees on each side of the ecliptic. In this circle the earth and all the planets revolve; so that no planet (except some of the *Asteroids*) is ever seen more than eight degrees north or south of the ecliptic—that is, above or below it. The names of the twelve signs, with their symbols, are—

Aries, . . .	♈	Leo, . . .	♌	Sagittarius, .	♐
Taurus, . .	♉	Virgo, . . .	♍	Capricornus, .	♑
Gemini, . .	♊	Libra, . . .	♎	Aquarius, .	♒
Cancer, . .	♋	Scorpio, . .	♏	Pisces, . . .	♓

The sun rises in Aries on the 21st of March, and in a month after in Taurus, and so on through the signs in monthly succession.

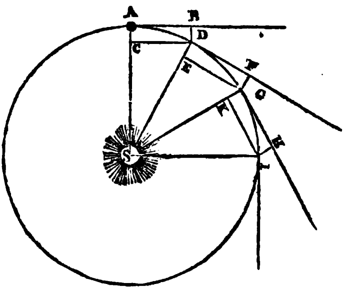
[a] *Eclipse.*—This term is derived from a Greek word, which signifies a *leaving out* or deficiency; of course, in this case, of light. *Ellipse* is from the same root, namely EK, *out*, and LEIPO (*leipso*), to *leave*. See note on Ellipse, p. 30.

[b] Of course, of the *principle* merely.

CHAPTER III.

CAUSES OF THE EARTH'S ANNUAL MOTION.

We shall now briefly explain the *causes* of the earth's motion round the sun. Let us suppose that the earth at its creation was projected forward into pure and boundless space, and it is certain[a] that if no obstacle occur to impede its course, it will move on in a straight line and with a uniform motion for ever; for, according to the laws of motion, *matter* has no more power to stop of itself when once put in motion, than it has, if at rest, to move of itself in any way. In the following diagram, let A represent the earth and S the sun,



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[a] It requires no argument to prove that, if a body is at rest, it must always remain so, unless moved from its position by the application of some force or power; but it appears strange and incredible, that if a body is set in motion, it must move on for ever, unless some obstacle occur to prevent it. This is clearly proved in the following illustration of an argument from Archbishop Whately's Rhetoric, page 70:—

"One part of the law of nature, called the 'vis inertiæ,' is established by the argument alluded to, (The Argument of Progressive Approach:) viz., that a body set in motion will eternally continue in motion with uniform velocity in a right line, so far as it is not acted upon by any causes which retard or stop, accelerate or divert its course. Now, as in every case which can come under our observation, some such causes do intervene, the assumed supposition is practically impossible, and we have no opportunity of verifying the law by direct experiment; but we may *gradually approach* indefinitely near to the case supposed; and on the result of such experiments our conclusion is founded. We find that when a body is projected along a rough surface, its motion is speedily retarded and soon stopped; if along a smoother surface, it con-

and let us suppose that the earth, having been projected forward, is moving in a straight line with a velocity that would carry it on to B in the space of a month, while the attraction of the sun, under whose influence it has now come, would bring it to C in the same time. Now, as the earth is impelled by two forces acting perpendicularly to each other, it is certain that it will obey neither the one nor the other, but like a ball struck at the same instant by opposite forces, it will move in a direction between them. It will not however, like the ball, move in a straight line, or, as it is said, describe the diagonal of a parallelogram; because as the power of attraction continues to act upon the earth, without ceasing, it continually draws it out of the straight line, and thus converts its course into a *curve*. This is exemplified in the parallelogram A B D C, in the foregoing diagram. A D is the line described by the earth, in the same time in which it would have described either the line A B, or A C, that is, according to our supposition, in the space of a month. A D is of course a curved line, but as every point of it may be considered as constituting the diagonal of an infinitely small parallelogram, the earth may be said to move as a ball would under similar circumstances. The earth is now at D, and its tendency is to move in a straight line to F in the space of a month, while the attraction of the sun would bring it to E in the same period of time. But, as before, the earth will follow neither the one impulse nor the other, but will move between them in the line D G, which it will describe in the same time in which it would have described either the line D F or D E, that is, in the space of a month. We have now the earth at the point G, and its tendency is to move in a straight line to H, in the space of a month, while the sun's attraction would carry it to K, in the same time. But the combined action

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tinues longer in motion; if upon ice, longer still; and the like with regard to wheels, &c., in proportion as we gradually lessen the friction of the machinery. If we remove the resistance of the air, by setting a wheel or pendulum in motion under an air-pump, the motion is still longer continued. Finding, then, that the effect of the original impulse is more and more protracted, in proportion as we more and more remove the impediments to motion from friction and the resistance of the air, we reasonably conclude that if this could be *completely* done (which is out of our power,) the motion would never cease, since what appear to be the only causes of its cessation, would be absent."

of these two forces will, as in the foregoing cases, cause the earth to move between them in a curved line; that is, it will describe the line G I, in the parallelogram G H I K, in the same time in which it would have described either G H or G K.

We have now followed the earth from the point A to the point I, that is, through one-fourth of its orbit, which it has described in the space of three months; and it may be easily shown, by drawing lines at right angles, to represent the forces of projection and attraction, and by completing the parallelograms, that it will describe the entire circle in the course of twelve months.

We have now seen that the earth's motion round the sun in an orbit or circle, is caused by the combination of the forces of projection and attraction. The former of these forces is called the *centrifugal* force, because it impels the earth to *fly* from the sun in a tangent or straight line, touching its orbit; and the latter, the *centripetal*, because it causes the earth to *seek* or move towards the sun, or the *centre* around which it revolves.

What proofs of the Divine power and goodness these magnificent motions display! If the earth had been at the creation projected in the direction of, or *too near* the sun, its destruction would have been inevitable; or if it had been projected *too remote*, or in a line beyond the influence of the sun's attraction, the consequences would have been equally disastrous. And even now, if either of these motions were to prevail over the other, the result to our globe would be fatal. In the one case, it would be burned up and destroyed by falling to the sun; and in the other, it would fly off into infinite space never more to be warmed or enlightened by his rays.

And, strictly speaking, the centrifugal and centripetal forces do not in every part of the earth's orbit exactly counterbalance each other; and the consequence is, that the earth deviates from an exact circle, and describes what is called an ELLIPSE[a]

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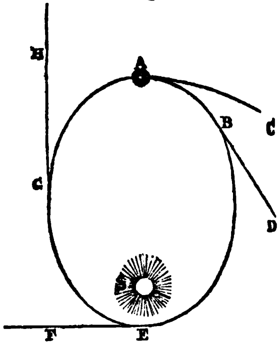
[a] *Ellipse.*—This term is another form of the word *eclipse*, and primarily means a *leaving out*. In making an ellipse, we leave out as it were a part of the radius, not giving the full sweep of the compasses, as in a circle. An elliptical orbit and an elliptical sentence have each something *left out*. See note on *Eclipse*, page 27.

or oval. The annexed diagram, in which S represents the sun and A the earth, is an ellipse.



At A the earth is in APHELION,[a] that is, in that part of its orbit most remote *from the sun*, and its motion or velocity will in consequence be slower. In this case, the force of attraction will begin to prevail, and the earth, instead of describing the circular arc, A C, as in the former diagram, will move nearer the sun in the elliptical line A B. At B the projectile or centrifugal force impels the earth in the direction B D, but the centripetal force continues to draw it nearer and nearer to the sun till it arrives at E. As the centripetal force increases as the earth approaches the sun, there appears to be some danger of the earth's being drawn into it, particularly as the direction of the force of projection is no longer perpendicular to that of attraction, but inclines more nearly to it, and therefore counteracts it less. The earth, however, with a motion constantly increasing, arrives in safety at E, and all appearance of danger is over. For though the earth will be attracted most powerfully at E, being in PERIHELION, or in that part of its orbit which is nearest to the sun, the velocity which it has acquired in approaching the sun will increase its centrifugal force, so as to make it prevail over the power of attraction; and the earth will consequently move from the sun in the direction

[a] *Aphelion.*—From the Greek words APO, *from*, and HELIOS, *the sun*. *Perihelion* is from the same root, and PERI, *about* or *near*.

E G. In motion round a centre, the centrifugal force increases with the velocity of the moving body; or in other words, the quicker it moves, the stronger is its tendency to fly off in a straight line. When a stone is whirled round in a sling, for instance, its tendency is to fly off in a tangent to the circle it describes, and the quicker it is whirled round, the stronger, of course, is its tendency to fly off.

Thus at E in the diagram, the centrifugal force of the earth is at its maximum, in consequence of the increased velocity which it has acquired in approaching the sun, and its tendency, therefore, will be to fly off with accelerated speed in the direction E F—that is, away from the dangerous proximity of the sun. But this equally dangerous tendency is kept in check by the centripetal force which at this point is also at its maximum; and the consequence is, that the earth moves in the curved line E G. As at the point E the two forces act perpendicularly to each other, we might expect that the earth, as in the preceding diagram, would move in the arc of a circle; but *notwithstanding the proximity of the sun*, the centrifugal force predominates here, and the earth is, in consequence, dragged away in the elliptical line E G. At G the centrifugal power impels the earth in the direction G H, while the centripetal force draws it towards S, and the consequence is, that it moves between them in the line G A; and in describing this line, the earth will travel slower and slower till it arrives at A; because its motion is always retarded in proportion as it recedes from the sun. When the earth arrives at A its velocity is so diminished that the centripetal force, though it also is at its minimum here,[a] begins to predominate over the centrifugal, and the earth will, in consequence, continue to move in the course already described.

But great care should be taken to inform the pupils that the orbit of the earth, though an *ellipse*, differs little in reality from a *circle*. The representation of it in this diagram has been purposely given *in excess*, in order that a clearer view might be had of the causes which retard or accelerate the motion of the earth in receding from, or approaching to the sun. The longer diameter or axis of the earth's orbit is

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[a] The centripetal force is, of course, least powerful when the earth is in *aphelion*. See note page 31.

only about *one-sixtieth* part longer than its shorter axis—from which it follows that the orbit itself differs very little from a circle. The one-sixtieth part of the axis of the earth's orbit, however, is about three millions of miles, which, of course, is the difference in the distance of the earth from the sun when in *aphelion* and *perihelion*. But even this immense distance amounts to almost nothing when compared to the entire distance of the earth from the sun—namely, ninety-five millions of miles. That this is so, follows from the fact that the earth is actually nearer the sun in the *winter* of our year than it is in the summer.[a] This may appear surprising and even incredible, but it is easily explained. The *longer* the sun is above the horizon, and the *more direct* his rays are, the more heat he communicates, and the reverse of this is equally evident. Now the *days* are *longer* in summer than in winter, and the rays of the sun, in consequence of his higher elevation in the heavens, shine upon our part of the earth *more directly;* which two causes *more* than counterbalance the proximity of our hemisphere to the sun during the winter half-year.

In further illustration of this, it may be observed, that during the *polar* summer the sun is for months above the horizon, and yet the temperature is never great, because the rays of the sun strike the earth very *obliquely*, in consequence of his low elevation in the heavens. Again, the sun is at the same distance[b] from us when rising or setting, as he is when on our meridian, and yet we all know that it is much warmer in the middle[c] of the day, than it is either in the morning or evening. The cause,[d] of course, is the greater directness of the sun's rays when on the meridian.

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[a] That is, if we are in the *northern* hemisphere.

[b] Because every point of the immense concave or hollow *hemisphere* of the heavens, is at the same distance from the *centre*, at which every spectator imagines himself to be situated.

[c] Strictly speaking, the greatest warmth is not in the middle of the day, but in two hours or so after, because the heat continues to *accumulate* for some time after the sun has reached the meridian; just as *midsummer* is not the hottest part of the year, but two months or so after. And for a similar reason, the night is colder towards morning than it is at *midnight;* and with regard to *midwinter*, we need only quote the old proverb, "*As the day lengthens the cold strengthens.*"

[d] A *contributing* cause is, that the more direct the sun's rays are, the less of the atmosphere they have to travel through in reaching the earth.

CHAPTER IV.

MAGNITUDE AND MEASUREMENT OF THE EARTH.

HAVING explained the figure and motions of the earth, we have now to show how its MAGNITUDE has been determined.

As the earth is a *spherical* body, its magnitude will depend upon the length of its DIAMETER[a] and CIRCUMFERENCE.[b] But how can the length of either be ascertained? We cannot follow a straight line through the centre of the earth, from side to side, to ascertain its length; nor can we even travel round the surface of the earth in a circle[c] to measure its circumference. Nor is it necessary to attempt either. For, as the circumference of the earth, like every other circle,[d] is conceived to be divided into 360 equal parts, or degrees, it is evident, that if we can ascertain the length of any one of these parts, we have only to multiply it by 360, to find the length of the entire circumference. And as the proportion between the diameter of a globe and its circumference is known to be nearly as one to three, it is plain that the circumference of the earth will give us the length of its diameter. For example, it has been ascertained by actual measurement that the length of a degree on the earth's surface is about $69\frac{1}{10}$ English miles, which, multiplied by 360, gives nearly 25,000 miles for the whole circumference; and as the diameter of a globe or circle is something less than one-third of the circumference, it follows that the diameter of the earth is about 8,000 miles in length.

But how is a degree on the earth's surface measured? The process is easily understood, but it requires a previous knowledge of the CIRCLES which, for the purpose of measur-

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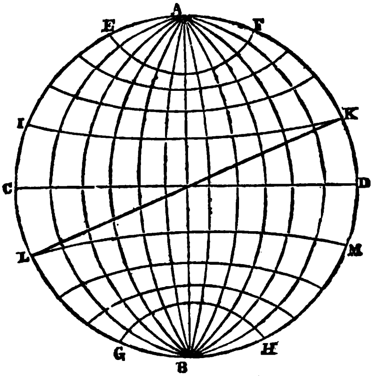
[a] *Diameter*, from the Greek words *dia*, through, and *metreo*, to measure. A diameter *measures* a globe or circle *through* the centre, from any point in the circumference to the point opposite.

[b] *Circumference*, a line or circle *carried round* the surface of the earth, so as to divide it into two equal parts or halves.

[c] Of course in a *great* circle. See note, page 22.

[d] See page 24, for the origin of the division of the circle into 360 degrees; and it should also be noted that degrees are subdivided into *sixty* equal parts, called MINUTES; and that minutes are also subdivided into *sixty* equal parts, called SECONDS. The following marks are used to denote *degrees*, *minutes*, and *seconds*—$^{\circ}$ $'$ $''$. For example, $5^{\circ}\ 26'\ 20''$ means five degrees, twenty-six minutes, and twenty seconds.

ing the earth's surface, and determining the position of places, astronomers have supposed to be drawn round both the CELESTIAL and TERRESTRIAL SPHERES.



In this figure, which represents on a *plane* surface *one-half* of the terrestrial sphere, C D is the one-half of the equator,[a] which, as we mentioned before, is a circle supposed to be drawn round the middle of the earth, or at an equal distance from each pole. As the plane of the equator passes through the centre of the earth, it divides it into two equal parts, and is, consequently, A GREAT CIRCLE. The half of the globe above or *north* of the equator is called the NORTHERN HEMISPHERE, and the half below or *south* of the equator is called the SOUTHERN HEMISPHERE. The word hemisphere means *half* of a *sphere* or globe.

A and B are the POLES of the earth, or its extreme *northern* and *southern* points; and the lines or circles drawn from A to B are MERIDIANS.

The circles which are drawn *parallel* to the equator are called PARALLELS. And in the northern hemisphere, I K

[a] If you stand opposite to a globe, and at some distance from it, the half of the equator, as in the diagram, will appear to you to be a *straight* line, and not a *semicircle*. The half of a meridian presents a similar appearance when you stand opposite to it, as A B in the diagram.

represents the tropic of Cancer, and E F, the Arctic circle; and in the southern hemisphere, L M is the tropic of Capricorn, and G H, the Antarctic circle. L K represents the one half of the ecliptic, but it refers to the heavens. See page 26, and note at bottom.

[Young persons may be led by familiar illustrations, such as the following, to form clear and correct ideas of LATITUDE and LONGITUDE. Put a pin up to the head in any part of an orange, which is equidistant from the top and bottom of it; and having attached a thread to it, carry it fairly round the middle of the orange till it comes to the pin again. Now attach the thread to the pin by giving it a turn or two round its head; and the *circle* formed in this way will represent the *Equator*, and its division of the earth into two equal parts or HEMISPHERES. The half of the orange *above* the circle formed by the thread represents the *Northern*, and the half which is *below* it, the *Southern* hemisphere.

In that part of the surface of the upper half of the orange, which is farthest from the circle formed by the thread, put a pin up to the head; and in the opposite, or lowest point of the surface of the under half of the orange, put in another pin in the same way, and the heads of these pins will represent the *North* and *South Poles* of the earth. Connect these two points, on both sides of the orange, by a thread drawn along its surface; and the circle formed in this way will represent a *meridian*, and its division of the earth into two equal parts or HEMISPHERES. And should this meridian pass through London, it will be called the *First Meridian;* and the two hemispheres into which it divides the earth will be called, the one the *Eastern*, and the other the *Western* hemisphere. The Eastern hemisphere is to the *east* of the First Meridian, and the Western hemisphere to the *west* of it.

Now, LATITUDE is the measurement of the earth from the *equator* to the *poles;* and there is no more difficulty in conceiving how this is done than you would have in measuring the distance between any point of the circle of thread round the middle of the orange, and the head of the pin at the top or bottom of it. This, of course, you would do by drawing a *straight* line along the surface of the orange, from the thread to the head of either of the pins; but this line will obviously be the *fourth* part of a circle, and it contains, as we know, *ninety degrees*, for all circles, however they may differ in size from each other, contain the same number of degrees, namely, 360. A degree, or the 360th part of a small circle like this, is almost too minute for measurement; but the degrees of a *meridian*, or great circle of the earth, are each *sixty* geographical, or nearly *seventy* English miles in length. And hence, we see that the distance of each of the axles of the earth, from the equator, is 90 degrees of a *meridian* circle, or, in other words, about 6,000 miles.

And hence we see, also, that the distance of any place *between* the equator and the poles, must be *less* than 90 degrees; and if we wish to ascertain the exact distance from the equator, or, in other words, its *latitude*, we have only to draw a line through it from pole to pole. The circle formed by this line will be its meridian, and its latitude will evidently be *the arc of its meridian intercepted between it and the equator.* And if we follow the *parallel* of the place to any meridian that is *graduated*, we shall find the number of degrees which this arc contains; for as all meridians are of the same size, all equal or corresponding parts of them must contain the same number of degrees; and hence, we see that *if one meridian be graduated, it will answer for all the rest.* Such a meridian on the globe is called a UNIVERSAL MERIDIAN.

To make this perfectly clear, divide two quarters of a meridian into *nine* equal parts each, beginning at the equator; and at the end of the first part put the figure 10, because it contains *ten* degrees; at the second, 20; at the third, 30; at the fourth, 40; at the fifth, 50; and so on. Now, if from each of these parts circles be drawn round the globe *parallel* to the equator, it will be evident that all the places through which they pass are the same number of degrees distant from the equator, that is, 10, 20, 30, 40, or 50, as the case may be. And hence the *Parallels*, though really circles of *longitude*, are called *Parallels of Latitude.* Without their assistance we could not tell the latitude of places upon *maps*, unless all the meridians were graduated.

In the same way, it should be shown that LONGITUDE is the measurement of the earth, from the First Meridian *eastward* or *westward* to the Anti-Meridian, or half round the globe, and that, consequently, the longitude of a place is *the arc of its parallel intercepted between it and the first meridian.* This arc is not *graduated*, but the *number* of degrees which it contains will be found by following the meridian of the place to the Equator; for as the graduation of one meridian answers for all the rest, so the graduation of the equator answers for the graduation of all the circles that are parallel to it. But it should be kept in mind, that *degrees of longitude*, except on circles equidistant from the equator, are of different lengths, because they are the 360th parts of unequal circles, namely, the *parallels* and the *equator.* On the contrary, the *degrees of latitude* are all of the same length, because they are the 360th parts of equal circles, namely, the *meridians.*]

The LATITUDE of a place is its distance from the *equator.* If a place is *north* of the equator, it is said to be in NORTH LATITUDE, and if *south*, in SOUTH LATITUDE. It is evident, that the entire *northern* hemisphere is in north latitude, and the entire *southern* hemisphere in south latitude.

But to say, that a place is in north or in south latitude, gives little or no idea of its precise position. In fact, it is merely saying, that it is either in the northern or southern hemisphere, or *half of the globe*. Its precise distance not only from the equator, but from the FIRST MERIDIAN, must be ascertained.

A line drawn due *north* and *south* through any place, is called its MERIDIAN; and if it is continued round the globe,[a] it forms a CIRCLE called a MERIDIAN. The meridians cut the equator at right angles; and as they run due north and south, it is evident that they must all pass through the extreme northern and southern points of the earth's surface; or in other words, through the POLES. These circles are called *meridians*,[b] because, as the earth turns on its axis, when any one of them is opposite to the sun, it is *mid-day*, or noon along that line.[c]

The meridians, like all other circles, are conceived to be divided into 360 equal parts or degrees. *Half* of a meridian circle, therefore, contains 180 degrees, and the *quarter*, of course, 90 degrees. Now, the distance from the equator to each pole is evidently the fourth part of a meridian circle, and consequently, 90 degrees.

We have now a measure for the *latitude* or distance of a place from the equator, namely, the QUADRANT, or *fourth* part of a meridian circle. This quadrant, of course, passes over the place; and as it is divided into ninety equal parts or degrees, we have only to reckon the number of the parts, intercepted between the place and the equator, to ascertain the exact latitude. If there be 10, 20, or 45, for instance, then we say, that the place is 10, 20, or 45, degrees, north or south latitude, as the case may be. The brass ring in which a terrestrial globe is hung, is called the *universal* meridian, because, by turning the globe round, every place on its surface can be brought under this meridian, and its distance from the equator or its latitude thus ascertained. With this view, this circle is divided into four quadrants of ninety degrees each.

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[a] The one *half* of the circle is usually called the *meridian*, and the other *half* the *anti-meridian*.

[b] *Meridian* is derived from a Latin word (*meridies*) which signifies the *middle* of the *day*.

[c] For *ninety* degrees north and south of the point over which the sun is perpendicular, that is, for half of the circle. See page 25.

In a MAP of the world the circles which run *parallel* to the equator enable us to determine the exact latitude of places; and hence they are called PARALLELS OF LATITUDE. As these circles are parallel to the equator their direction is *east* and *west*, and though every place, in the least degree *north* or *south* of any of these circles, might have a parallel of latitude passing through it, yet in most maps only sixteen are described—eight north and eight south of the equator. By these eight circles in each hemisphere, the meridian quadrants are divided into nine equal parts of ten degrees each; the first circle being ten degrees from the equator, and the last ten degrees from the pole.

When we wish to find the exact latitude of any place, we have only to look at its position with regard to a *parallel of latitude*. If the parallel runs through it, let us follow the line to either side of the map, and the latitude will be found marked in degrees; and if the parallel runs a little above or a little below the place, we have only to follow its course or curve to either side of the map, and the latitude will be found marked in like manner.

But it would be of little use to know the latitude of a place unless we knew its LONGITUDE also.[a] *Longitude* is the distance of a place *east* or *west* from the FIRST MERIDIAN. The first meridian on our maps passes through Greenwich, in the vicinity of London; and other nations, in like manner reckon their longitude from their respective capitals; as the French from Paris, and the Spaniards from Madrid.

[a] The terms LONGITUDE and LATITUDE—that is, *length* and *breadth*—are inapplicable to a *spherical* body; but when they were first applied to the earth it was supposed to be a flat or plain surface, extending farther from *west* to *east* than from *north* to *south*. Hence, from west to east they called *longitude*, and towards the north and south, *latitude*. A map of the world, "as known to the ancients," shows this clearly. From north to south, little more than the northern parts of Africa and the southern and central parts of Europe are given, and from west to east, ("*Gadibus usque ad Auroram et Gangem*")—from the Straits of Gibraltar (*Pillars of Hercules*) to India beyond the Ganges. The MEDITERRANEAN sea is in the *middle* of the *earth*, as known to the ancients; and hence its name, *middle* of the *earth*, not middle of *the land*—a name by which the Baltic and other seas might as well have been called. But with regard to the propriety of the terms *longitude* and *latitude*, as applied to the earth, it may be observed that, *strictly speaking*, they are correct; for the earth is actually *longer* in the direction of *longitude* than it is in the direction of *latitude*—its *equatorial* diameter being longer than its *polar* by about twenty-six miles. See page 46.

There is no natural or peculiarly appropriate place to commence longitude from, as there is for latitude—namely, the circle which passes round the middle of the earth, *equidistant* from each pole, or in other words, the EQUATOR.

As longitude is the distance of a place *east* or *west* from the first meridian, it is measured on the circles which run in that direction, namely, the *Equator* and *Parallels* of *Latitude*. But, for the sake of convenience, the equator is made to serve as a general measure of longitude; and for this purpose it is always graduated or divided into 360 equal parts or degrees. If a place is on the equator, its longitude is found by reckoning the number of degrees on the arc of the equator intercepted between the place and the first meridian. If there be 10, 20, 50, or 100 degrees, for instance, then the place is 10, 20, 50, or 100 degrees east or west longitude, as the case may be. But if the place is north or south of the equator, which, of course, almost every place is, its longitude is really *the arc of its parallel intercepted between it and the first meridian.* But instead of measuring the arc of the parallel intercepted between the place and the first meridian, we follow its meridian to the equator, and count the *number* of degrees upon it. In this way, the meridians are made to assist in determining the longitude of places—just as the parallels are employed in enabling us to ascertain the latitude. Instead of *graduating each of the parallel circles* for the purpose of reckoning the longitude of the places over which they pass, we have only to follow the curve or course of their meridians[a] to the equator, and count the number of degrees upon the corresponding arcs. The corresponding arcs of the equator and parallels of latitude, are included between the meridians which run through them, at right angles, from pole to pole; and it is evident that each of them contains the same number of degrees; for the circles of which they are equal parts, like all other circles, contain 360 degrees each. But, though each of these corresponding arcs contains the same number of degrees, it is evident that the arcs themselves, and consequently the degrees marked upon them, are of unequal length. The length of a degree de-

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a If a meridian does not pass through the place, follow the curve or course of *the nearest*, and make the necessary allowance for the difference between it and the meridian of the place.

pends upon the magnitude of the circle, of which it is the 360th part. If the circle be 360 *miles*, or *feet*, or *inches* in circumference, a degree, or the 360th part of it, will be a *mile*, a *foot*, or an *inch*, as the case may be. Now, as the equatorial circle is evidently greater than any of the circles parallel to it, a degree on the former must be longer than a degree on any of the latter. The length of a degree on the equator is sixty geographical, or about $69\frac{1}{10}$ English miles; the length of a degree on a parallel of latitude, therefore, is less; and, as the parallel circles get smaller and smaller in proportion to their distance from the equator, it follows that the 360 degrees, into which each of them is conceived to be divided, get less and less in the same proportion, till at the poles they diminish to mere points.

The degrees of *longitude*, therefore, are of unequal and constantly varying length—because they are the 360th parts of *unequal* circles, namely, the *parallels of latitude;* while for a similar reason, the degrees of *latitude* are all equal—because they are the 360th parts of *equal* circles, namely, the meridians. In reducing the degrees of *latitude* to miles, therefore, we have to multiply them by sixty for geographical, and by $69\frac{1}{10}$ for English miles; while the degrees of *longitude*, except at the *equator*, must be multiplied by a less and constantly decreasing number. As the length of a degree of longitude evidently depends upon the distance of the place from the equator, there is a table in almost every treatise on Geography showing the length in miles of a degree of longitude at every degree of latitude. For instance, at 60° north or south latitude the length of a degree of longitude is stated to be thirty miles. If we wish, therefore, to reduce the degrees of longitude in latitude 60° to miles we must multiply them by 30; and if the latitude of the place is more than 60°, of course we must multiply by a less number than 30.

This table will be found in the following page; and before proceeding farther, the instructor should exercise his pupils in converting degrees of longitude into miles, both geographical and English, in any given latitude.[a]

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[a] It will, practically, be of great use to keep in mind the length of the degrees of longitude in a few important latitudes, such as the tropics, the polar circles, the latitude of the place we live in, &c.

TABLE, SHOWING THE LENGTH OF A DEGREE OF LONGITUDE ON ANY PARALLEL OF LATITUDE, BETWEEN THE EQUATOR AND THE POLES.

Degrees of Latitude.	Geographical Miles.	Degrees of Latitude.	Geographical Miles.	Degrees of Latitude.	Geographical Miles.
1	59·99	31	51·43	61	29·09
2	59·96	32	50·88	62	28·17
3	59·92	33	50·32	63	27·24
4	59·85	34	49·74	64	26·30
5	59·77	35	49·15	65	25·36
6	59·67	36	48·54	66	24·40
7	59·55	37	47·92	67	23·44
8	59·42	38	47·28	68	22·48
9	59·26	39	46·63	69	21·50
10	59·09	40	45·96	70	20·52
11	58·90	41	45·28	71	19·53
12	58·69	42	44·59	72	18·54
13	58·46	43	43·88	73	17·54
14	58·22	44	43·16	74	16·54
15	57·96	45	42·34	75	15·53
16	57·67	46	41·68	76	14·52
17	57·38	47	40·92	77	13·50
18	57·06	48	40·15	78	12·47
19	56·73	49	39·36	79	11·45
20	56·38	50	38·57	80	10·42
21	56·01	51	37·76	81	9·39
22	55·63	52	36·94	82	8·35
23	55·23	53	36·11	83	7·31
24	54·81	54	35·27	84	6·27
25	54·38	55	34·41	85	5·23
26	53·93	56	33·55	86	4·19
27	53·46	57	32·68	87	3·14
28	52·98	58	31·80	88	2·00
29	52·48	59	30·90	89	1·05
30	51·96	60	30·00	90	0·00

Another difference between latitude and longitude is, that the former is counted only *quarter* round the earth—namely from the equator to the poles; while longitude is reckoned east and west from the first meridian *half* round the earth. The greatest latitude, therefore, that a place can have is ninety degrees north or south, while longitude may extend to 180 degrees east or west from the first meridian. It is evident that the extremes of latitude are the poles of the earth, each of which is ninety degrees distant from the equator, north and south, and consequently 180 degrees

asunder. But the extremes of longitude, like many other extremes, meet at the same point—for it is evident that if two persons travel half round the world, setting out from the same place, the one due east and the other due west, they will meet at the same point. It is obvious, therefore, that places 180 degrees east, or 180 degrees west longitude, are under the same meridian.

We have stated that the degrees of latitude are all equal, because they are the 360th parts of equal circles, namely, the meridians; but strictly speaking, this is not entirely correct. Our great philosopher, Sir Isaac Newton, held that the earth, in consequence of its motion round its axis, is an *oblate* and not a *prolate* spheroid, as was maintained by some of the continental astronomers.[a] By an oblate spheroid, is meant that the earth is flattened in the direction of the poles, and protuberant about the equator; and actual measurements of the earth's surface have proved that this is the case. For instance, it has been ascertained that a degree of a meridian near the polar circles is rather

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[a] We have seen (page 28) that the tendency of a body in motion, is to move forward in a *straight line*. Hence the constant effort of a body moving round a centre to fly off in a tangent to the circle it describes. A sling, or a stone fastened to the end of a string and whirled round, exemplifies the principle. If the string breaks, or is let go, the stone flies off in a straight line or tangent to the circle it described while revolving. Hence, as the earth revolves on its axis, every particle on its surface has a constant tendency to fly off in a tangent to the circle it describes, and the farther the particle is from the centre of motion, the stronger is its tendency to fly off, because the greater is the velocity with which it is moving. Particles about the *equator*, therefore, have a stronger tendency to fly off than particles in the direction of, or about *the poles;* because as they describe greater circles in the same time, their velocity is greater. Hence, from the greater effort of the particles about the equator to escape, the earth is bulged out or protuberant in that direction; and for a similar reason the parts about the poles, where the rotatory motion is least, are flattened in proportion.

This principle may be familiarly illustrated by dipping a mop in water and twirling it round. When taken out of the water it is lumpish and shapeless, but, if twirled briskly round, its parts diverge, the water flies off *in drops* and *in tangents* to the circle it describes, and it assumes the form of an OBLATE SPHEROID. Again, if a flexible hoop be made to revolve with rapidity about a diameter, it will become flattened about the top and bottom, where the rotatory motion is least, and protuberant or bulged about the middle, where the rotatory motion is greatest. In other words, the figure which the hoop describes will be an OBLATE SPHEROID.

more than half a mile longer than a degree of the same meridian near the equator; from which it follows that the earth's surface must be flatter in the direction of the poles than it is about the equator. For the longer a degree is, the greater is the circle of which it is a 360th part, and the greater the circle, the less is its curvature, or in other words, the more nearly it approaches to a *straight* line, and consequently *the flatter is the surface* which it bounds or passes over. If a surface is perfectly *flat*, it is evident that a line bounding or lying along it is perfectly *straight;* and if a surface is *curved*, a line bounding it follows the curvature, and is consequently curved in proportion.

The degrees of latitude, therefore, in consequence of the flattening of the earth about the poles by its *rotatory* motion, are a little longer in proportion to their distance from the equator; while the degrees of longitude, on the contrary, get less and less in that direction, till at the poles they diminish to mere points. But the difference between the degrees of latitude is so slight, that generally and *practically* speaking, it may be said they are all equal.

But how is a degree on the earth's surface measured? At page 4, we have shown that in consequence of the *spherical* surface of the earth, the polar star appears to a person travelling due north or south, to ascend, or descend in the heavens, in proportion to the space passed over. Upon this fact, a most important principle in Geography is established, namely, that the latitude of a place in the northern hemisphere, always corresponds to the altitude of the polar star; and hence, to ascertain our distance from the equator, in the Atlantic Ocean, for instance, we have only to take the altitude of the polar star, and our latitude is determined. If the polar star, for instance, is 10, 20, or 53 degrees above the horizon, we may conclude with perfect certainty that our distance from the equator is 10, 20, or 53 degrees, as the case may be.

To make this perfectly clear, suppose we were at the north pole of the earth, our distance from the equator, or *latitude* would be ninety degrees; and the distance of the polar star from the horizon, or its *altitude*, would be ninety degrees also; for in that position it would appear in our *zenith*, or right above our heads; and consequently, ninety degrees above the horizon. Now, suppose we travel ten degrees in

the direction of the equator,[a] or due south, our distance from the equator would be diminished from ninety to eighty degrees; and the polar star would appear to have descended in the heavens in the same proportion, that is, our *latitude* and its *altitude* would be each eighty degrees. If we travel twenty, or thirty, or any number of degrees, under *ninety*, due south, from the pole towards the equator, our latitude and the altitude of the polar star will be found to decrease in proportion. *Half-way* between the pole and the equator, for instance, our latitude will be forty-five degrees, and the altitude of the polar star forty-five degrees also; and if we travel to the equator, there will be *no latitude*, because we are no distance from it; neither will the polar star have *any altitude*, for it will, in this case, be on the horizon.

This simple and beautiful principle in Geography, not only enables us, even in the middle of unknown seas, to ascertain our position on the earth's surface with regard to the equator, but it also furnishes us with the means of measuring the surface, and determining the magnitude of the earth.

As our latitude (Dublin) is 53° 23′, the altitude of the polar star above our horizon, is the same number of degrees and minutes, namely, 53° 23′. Now, if we travel due north, or due south, till we find that the polar star has increased or decreased a degree in altitude, it is evident from what has been said, that we have travelled a degree on the earth's surface. And if we measure the distance in miles between the point of departure, and the place from which the polar star seems to have increased or decreased a degree in altitude, making due allowance for elevated ground, we have the length of a degree, or a 360th part of the circumference of the earth—and, if we multiply this by 360, we have the extent of the ENTIRE CIRCUMFERENCE. The length of a degree on the earth's surface is found by actual measurement to be about $69\frac{1}{10}$ English miles,[b] which, multiplied by 360,

[a] It is obvious that if we move at all from our supposed position, it must be in the direction of the equator, or to the *southward.* In the same way, if a person move from the *south pole*, no matter in what direction, it will be *northward.*

[b] The length of a degree of a meridian in latitude 45 degrees, is found by actual measurement to be 69 miles, 79 yards, which may be taken as the mean length of a degree on the earth's surface. A degree on the same meridian farther northward or southward will, in consequence of the oblate figure of the earth, vary a little in length. At

gives 24,876 miles for the entire circumference; and, as the diameter of a globe or circle is something less than one-third of the circumference, we conclude that the length of the DIAMETER OF THE EARTH is about 8,000 miles.[a]

The latitude of a place may also be found by the MERIDIAN ALTITUDE of the sun, or its height above the horizon at twelve o'clock, on any day of the year. For every circle supposed to be drawn on the earth, there is a corresponding circle on the heavens. The equator of the earth, for instance, corresponds to, and if extended to the heavens would coincide with, the celestial equator. Hence, if we were at the equator of the earth, the celestial equator would be in our zenith, that is, directly over our heads. In such a position, it is evident that our zenith would be no distance from the celestial equator, because it would be in it; nor would we be any distance from the terrestrial equator, because we are supposed to be at it.

It is also evident, that if we move from the equator towards either pole, that is, north or south, our zenith distance from the celestial equator will increase in proportion to the space passed over; for, as the whole distance between the celestial equator and the poles of the heavens corresponds in the *number* of degrees to the whole distance between the terrestrial equator and the poles of the earth, (the former being the *fourth* part of a celestial, and the latter, the *fourth* part of a terrestrial meridian,) it follows that a corresponding part of the one will be equal, in the *number* of degrees, to a corresponding part of the other. Hence, if a person, setting out from the equator travels due north ten, twenty, or any number of degrees, a right line from his head to the heavens would describe an equal number of degrees on the corresponding celestial meridian. In other words, his ZENITH DISTANCE from the celestial equator will be equal (in the *number* of degrees) to his distance from the equator, that is, to his LATITUDE. If he travelled *ninety* degrees, for instance, north from the equator, his zenith would be the same

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the Arctic circle, a degree is about 386 yards more, and at the equator, about 558 yards less, than at the parallel of 45 degrees.

[a] The polar diameter, in consequence of the flattening of the earth at the poles, and its protuberance about the equator, is less than the *equatorial* diameter by about 26 miles. The *mean* diameter of the earth is 7,912 miles. See page 42.

number of degrees north from the celestial equator; for, in such a position, the pole of the heavens would be directly over his head, and the celestial equator in his rational horizon.

It is evident, from what has been said, that the latitude of any place may be found by determining its zenith distance from the celestial equator. But how is this done? If the equator were marked on the heavens, as it is upon an artificial globe, we could at once determine the latitude of any place, by measuring the arc of the meridian intercepted between the zenith of that place and the equator. But though the equator is invisible, its exact position in the heavens is easily ascertained. For if the sun is *north* of the equator, as he is from the Vernal to the Autumnal Equinox, we have only to subtract his DECLINATION[a] from his *meridian* altitude to find the altitude of the equator; and having thus found the height of the equator above the horizon, we have its distance from the zenith of the place in which the observation is made, and consequently the latitude, for we have only to subtract the altitude of the equator from *ninety* degrees, (the whole distance between the horizon and the zenith), and *the difference* will be the zenith distance of the place from the equator which, as we have just seen, will give us the latitude. For example, suppose the captain of a ship at sea, north of the equator, finds by his quadrant that the altitude of the sun, at twelve o'clock on any given day, say the 21st of June, is 70 degrees, he subtracts the sun's declination for that day, namely 23½ degrees, from 70 degrees, and the difference (46½ degrees) gives him the altitude of the equator. And having thus found the altitude of the equator (46½ degrees), he subtracts it from 90 degrees, and the difference (43½ degrees) will be his latitude.

But if the sun is *south* of the equator, his declination for the day is to be *added* to his meridian altitude, to find the altitude of the equator, which having found he proceeds as before. And when the sun is in the equator, as on the 20th of March, and the 22nd of September, his meridian altitude

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a The sun's DECLINATION, that is, his distance from the equator, is calculated for every day in the year, and inserted in the Nautical Almanac. *Declination* on the heavens corresponds to *latitude* on the earth.

will at once give the altitude of the equator, for in these cases, there is no declination to be either added or subtracted.[a]

We have seen how latitude may be found without the aid of maps and globes, even in the middle of unknown seas; and we have now to show how longitude may be ascertained under similar circumstances.

As the earth turns once round on its axis before the sun in twenty-four hours, every point on its surface, except the poles, describes a circle[b] or 360 degrees in that time. And as the earth turns round from *west* to *east*, it is evident, that plaees to the *east* will be turned to the sun sooner than places to the *west;* and the proportion will be, an hour for every fifteen degrees. For as the earth turns once round, or describes 360 degrees in twenty-four hours, it will in one hour turn round the twenty-fourth part of 360 degrees, that is, fifteen degrees. *Fifteen* degrees, therefore, on the earth's surface, from east to west, correspond to *an hour* of time. To persons residing fifteen degrees *east* of us, the sun will rise, reach the meridian, and set, an hour earlier than with us; and their time will, in consequence, be an hour before, or in advance of our time. When it is 6, or 12, or 8 o'clock with us, for instance, it is an hour more with them, that is, 7, or 1, or 9 o'clock, as the case may be. To persons living twice fifteen degrees to the east of us, the difference in time will be two hours; and so on in the proportion of one hour for every fifteen degrees—or which is the same thing,[c] four minutes for every degree. To persons living to the west of

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[a] On the same principles the latitude of a place may be found by taking the meridian altitude of the moon, or of any fixed star whose *declination* is known, (and the declinations of the principal stars are known and inserted in the Nautical Almanac). Should the zenith distance of the sun, moon, or star, when on the meridian, be taken, instead of the altitude, it will evidently amount to the same thing; for if we know the distance of any body from the zenith we have only to subtract it from 90° to find its distance from the horizon; that is, its altitude. The zenith distance is more convenient on *land*, because from the inequalities of the earth's surface, it is difficult to obtain a true horizontal boundary.

[b] See note, page 43.

[c] As the earth turns 360 degrees in twenty-four hours, it will turn *one* degree in the 360th part of twenty-four hours, that is, in four minutes. Or, in other words, as the earth turns fifteen degrees in an hour, in the fifteenth part of an hour, that is, four minutes, it will turn one degree.

us, the reverse of this is the case.[a] Their time is *after* ours in the same proportion, namely, four minutes for every degree, or one hour for every fifteen degrees.

Hence, by knowing the difference of the longitudes of any two places, we can at once determine the difference in their time; and in like manner, by knowing the difference in their time, we can determine the difference in their longitudes. On most globes and maps there is a meridian drawn through every fifteen degrees of longitude, in all twenty-four meridians, to correspond with the twenty-four hours of the day; and if we wish to ascertain the difference in the time of any two places, we have only to count the number of meridians between them, each of which corresponds to an hour. At the place to the *east*, the time will be in advance, in the proportion of an hour for every meridian,[b] or four minutes for every degree.

We are now supplied with a principle which enables us, at sea, or in any unknown region of the earth, to determine our longitude, or distance east or west from the first meridian.

The CHRONOMETER, which we are supposed to bring with us, shows us London or first meridian time; and our own watches as regulated by the sun, show us the time of the place at which we happen to be. Now, the difference between these times, that is, between the chronometer, set to London time, and our own watch, as regulated by the sun, enables us to determine our distance, east or west from the first meridian. For, if the difference be one, or two, or three, or six hours, then our distance from the first meridian or longitude, will be fifteen, thirty, forty-five, or ninety degrees, as the case may be. And if our time is in advance of, or before London time, then we are so many degrees *east* longitude; but if behind or slower, so many degrees *west* longitude. For, as we saw before, time comes *earlier* to the *east*, and later to the west. If when it is 12 o'clock by our watch, for instance, we look at the chronometer, and find that it is 10 o'clock by it, we conclude that we are

[a] Or rather, it is the same thing; we live to the *east* of them, and therefore our time comes earlier.

[b] That is, for every fifteen degrees; a meridian being supposed to be drawn through every fifteen degrees of longitude. If a meridian be drawn through every ten degrees, it will, of course, represent forty minutes.

twice fifteen, or thirty degrees to the *east* of the first meridian. But if in this case, it is one, two, or three o'clock by the chronometer, then are we fifteen, thirty, or forty-five degrees *west* of the first meridian.

In the case we have supposed,[a] the sun is opposite to us, or on our meridian; and as the meridian of London is, as shown by the two hours' difference in time, thirty degrees to the west of us, it is evident from what has been said, that it will be two hours before London, and the places in a line with it, north and south, will be in a similar position with regard to the sun. When by the earth's rotation this takes place, it will be 12 o'clock along the meridian of London, instead of 10; and instead of 12 with us, it will be 2 o'clock; for we now shall have moved thirty degrees to the east of our former position with regard to the sun, that is, we shall have passed the meridian two hours ago. But if it be 2 o'clock by the chronometer, when it is 12 o'clock by us, the meridian of London must have been opposite the sun two hours before, as in this case we are thirty degrees to the west of it.

But as even the best chronometers fail to keep exact time, other methods for finding the longitude have been sought. The eclipses of Jupiter's satellites enable mariners to ascertain London or first meridian time, and thus to determine their longitude. In the Nautical Almanac the precise times in which the several satellites appear eclipsed to a spectator in London are calculated for two or three years in advance, so as to serve for long and distant voyages, and inserted in a table composed for the purpose. And hence, when a navigator wishes to regulate his chronometer, or to ascertain London time, he watches for an eclipse of one of these satellites, and by comparing the time in which it becomes visible to him, with the time in which, according to his almanac, it is visible to a spectator in London, he is enabled to determine his longitude. For instance, if an eclipse, which is calculated in his almanac to appear to a spectator in London at 11 o'clock on a certain night, becomes visible to him at 8 o'clock the same evening, it is evident, as it will be seen by both at the same moment, that he is three hours behind London time, and consequently three times fifteen degrees

[a] That it is 12 o'clock by our watch, as regulated by the sun.

to the west of the first meridian. But if he observe an eclipse taking place at 12 o'clock at night, for instance, which his almanac states will appear in London at 8 o'clock the same evening, it is evident that he is four hours in advance of London time, and consequently four times fifteen or sixty degrees to the eastward of the first meridian.[a]

We have seen how the circumference, diameter, and general magnitude of the earth have been determined; and we have been made acquainted with the means by which the relative and actual positions of places on its surface may be ascertained—we shall now show how the distance between any two places on globes or maps may be found.

1. If the places are on the *same meridian*, but in different hemispheres, we have only to multiply the sum of their latitudes by 60 for geographical, or by $69\frac{1}{10}$[b] for English miles to find the distance between them.[c] For instance, if one of the places is 20° north, and the other 10° south of the equator, the distance between them in degrees of *latitude* is evidently 30, which, multiplied by 60, gives us 1,800 geographical, or, by $69\frac{1}{10}$, 2,073 English miles.

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[a] What is said here is merely in illustration of the principle, as this method of finding the longitude is found to be impracticable at sea, in consequence of the motion of the vessel. For, in order to observe these eclipses, it is necessary that the telescope should be perfectly steady. Besides it would be requisite, either that the vessel should remain at the place at which the time was regulated by the sun, till the eclipse occurred; or that the distance she may have moved *east* or *west* during the interval should be known and taken into account. The eclipses of the moon and of the sun are better adapted for this purpose, but they are of rare occurrence.

The longitude at sea may be found when the moon is visible, by taking her angular distance from the sun, or from one of nine conspicuous stars which lie near her orbit or path. The distance of the moon from the sun, and from these nine stars, is given in the Nautical Almanac for every three hours of Greenwich time; and the general principle is, that the difference between Greenwich time as noted in the Almanac, and the time at the place where the longitude is sought, when converted into degrees, will be the longitude of the ship. This is called the LUNAR METHOD of finding the longitude.

[b] Or, in round numbers, by 70, the result, of course, will be a little in excess.

[c] There is no more difficulty in this than in answering the following questions:—If one town is 20 miles due north, and another 10 miles due south from Dublin, what is the distance between these two towns? (30.) But if one town is 10 miles due north from Dublin, and another 30 miles from it in the same direction, what is the distance between these two towns? (20.)

2. If the places are on the same meridian, and in the same hemisphere, the difference between their latitudes, multiplied by 60 for geographical and $69\frac{1}{10}$ for English miles, gives us the distance between them. For instance, if one of the places is 10° and the other 30° north latitude, we have only to subtract 10 from 30, and multiply the difference as before.

If the places are on the *same parallel*, their distance from each other in *degrees* is found in like manner—that is, by adding their longitudes, if in different hemispheres—or by subtracting them from each other, if in the same hemisphere. But their distance in *miles* is found not by multiplying by 60, as in reducing the degrees of *latitude*, but by the number of miles contained in a degree of longitude on that parallel under which the places in question lie.[a] For instance, if one of the places is ten degrees east, and the other twenty degrees west of the first meridian, it is evident that the sum of their longitude (10° E. + 20° W. = 30°) gives their distance from each other in degrees of longitude; but if the places are on the same side of the first meridian, the one say 20° and the other 40° east of it, it is equally evident that the difference in their longitude (40° — 20° = 20°) gives their distance from each other in degrees of longitude. And it is clear from what has been said that to reduce these degrees to *miles*, we must multiply not by 60, except *at the equator*, but by the number of miles contained in a degree of longitude in that particular latitude in which the places in question lie. By referring to the table, we find that the number of miles in a degree of longitude in our latitude (Dublin) is about 36 miles. If we wish, therefore, to find the distance in miles between Dublin and Manchester, for instance, which are nearly under the same parallel, we have merely to multiply the difference between their longitudes (6° 20′ and 2° 14′) by 36, and the result will be about 150 miles.

But when, as is generally the case, two places are on different parallels and different meridians, we have merely to take the distance between them with a pair of compasses or piece of tape, and measure it on the equator, or graduated side of the map. This will give us their distance in degrees,

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[a] The number of miles in a degree of longitude in every latitude is found in the table mentioned, page 42.

which, as they are degrees of a great circle, we may reduce to miles by multiplying by 60. We say degrees of a *great*[a] circle because it is evident that the shortest distance between any two points on the globe is an arc of the great circle which joins them; and we measure this arc on the *equator* or on a *meridian;* because, as all great circles are equal, it is immaterial which we adopt as a measure. For example, if the distance thus taken between two places on a globe or map is found when carried to the equator, or the graduated side of the map, to contain 10, 20, or 50 degrees, their distance in geographical miles will be 10, 20, or 50, multiplied by 60. In measuring the distance between any two places or points upon a map, we take care not to use the graduated scale at the top or bottom; for the degrees represented there are degrees of *longitude*, which, as we have seen, vary in length according to their distance from the equator. The graduated sides of a map, on the contrary, represent meridians—the degrees of which are all equal to 60 geographical or $69\frac{1}{10}$ English miles. The *sides* of a map, therefore, should always be the scale by which the distance between any two places or points upon it must be measured.

The instructor should now exercise his pupils in measuring, and calculating the distance between any two given points or places on the earth's surface, as laid down in their maps. The table in page 42 will enable them to convert the degrees of longitude into geographical miles, which they can easily reduce into English miles. They should also be exercised in converting longitude into time, and *vice versa.*

CHAPTER V.

ZONES—CLIMATES—TEMPERATURE.

We have seen[b] that, in consequence of the inclination of the earth's axis, and its constant direction to the same point in the heavens during the entire annual revolution,[c] the northern and southern hemispheres are enabled to enjoy in their turn an equal portion of the light and heat of the sun. But though both hemispheres, generally speaking,[d] enjoy

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[a] *Great Circle*—See note, page 22.
[b] See pp. 18 and 21. [c] See note, p. 24. [d] See p. 66.

an equal portion of light and heat, yet in the hemispheres themselves there is a great diversity of temperature, in consequence of the rays of the sun striking the surface *directly* in some parts and *obliquely* in others. In those parts of each hemisphere which lie near the equator, the rays of the sun strike the surface more directly, and these regions are, in consequence, excessively warm; while in the direction of, and about the poles, in both hemispheres, the sun shines more and more obliquely, and the consequence is, that the temperature in these parts of the earth becomes less and less in proportion.

Hence the division of the earth's surface into ZONES, and its subdivision into CLIMATES. The word zone means a *girdle* or belt, and the term climate a *gradation*. The zones are five in number—namely, one TORRID, two TEMPERATE, and two FRIGID. The Torrid zone encompasses the middle or warmest part of the earth; and hence its name *torrid*, which implies excessive heat. This division of the earth extends to 23½ degrees on each side of the equator, and consequently comprehends a large and equal portion of both hemispheres. Through the northern limit of the Torrid zone the tropic of Cancer is conceived to be drawn, and through the southern the tropic of Capricorn. The Torrid zone, therefore, lies between the tropics, and the sun is, consequently, always vertical or over head in some part of it.

The North Temperate zone lies between the tropic of Cancer and the Arctic circle, and the South Temperate, between the Tropic of Capricorn and the Antarctic circle. Each of these zones, therefore, is 43 degrees broad. Except in those parts which lie near the equator and polar circles, neither the heat nor cold is in excess; and hence these great divisions of the earth's surface have been denominated the *temperate* zones.

The Frigid zones extend from the polar, or Arctic and Antarctic circles to the poles, and are consequently 23½ degrees broad each. In these regions of the earth the cold is excessive, particularly about the poles; and hence they have been designated the *frigid* zones. The extreme cold of the frigid zones is occasioned by the total disappearance of the sun during the winter; and the great obliquity of his rays during the summer of their year.

The extent of the zones in degrees will not, it is evident,

give us their real magnitudes; but the following estimate will enable us to form an idea of their relative sizes. It has been estimated that if the entire surface of the earth were divided into 100 equal parts, the Torrid zone would contain about 40; each of the Temperate zones about 26, and each of the Frigid zones about 4 of these parts. The inhospitable and frozen regions of the earth, therefore, are almost nothing when compared to the habitable parts of it.

The division of the earth's surface into zones was found, though *natural*[a] and appropriate, to be too general, and hence its subdivision into *climates*, which may be regarded as *small zones* or girdles, encompassing the earth from the equator to the poles. The different lengths of the days in different latitudes is the principle upon which this division was founded. At the equator, as we have seen,[b] the days and nights are equal throughout the year—that is, they consist of 12 hours each; but if we recede from the equator, north or south, this equality will cease to exist. When the sun is north of the equator the days are longer than the nights in the northern hemisphere; and when the sun is south of the equator the reverse of this is the case; and in the southern hemisphere, of course, similar changes take place.

At the equator the day is always 12 hours long, but at 8° 34′ north or south of it, the length of the day extends to 12½ hours. Now, if we conceive parallels of latitude to be drawn through those points of the earth's surface which are 8° 34′ distant from the equator north and south, we have inclusive the first climate in each hemisphere. Again, at the distance of 8° 10′ more, or in latitude 16° 44′ north and south, the length of the day is found to be *half an hour* longer—that is, 13 hours; and here, the boundary of the second climate, in each hemisphere, is conceived to be drawn. And, as the day increases from 12 hours at the equator to 24 hours at the polar circles, it is evident that there are 24 climates between the equator and each of the polar circles; for in every place where the day is longer by *half an hour* a new climate is conceived to commence. But from the polar circles to the poles, the climates are reckoned not by half-hours, but by *months;* for in these latitudes the sun, during

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[a] See page 22 for the *natural* position of the TROPICS and POLAR circles, the boundaries of the zones. [b] See page 23.

the summer, is for months above the horizon. From the polar circles to the poles, therefore, there are six climates, in each of which the days exceed each other in length by an entire month.

But it should be observed that, since the introduction of the parallels of latitude, the division of the earth into climates is little regarded—particularly as the temperature of a country is not always found to correspond with its climate or the length of the day. The south of Labrador and north of Ireland, for instance, are in the same climate—that is, the length of the day and the distance from the equator are the same; yet the temperature or degree of heat enjoyed by these countries is very different. In Table Bay, in Labrador, latitude 54°, the *mean* temperature is stated to be 32 degrees—that is, at the freezing point; while in the same latitude in Ireland the mean temperature is nearly 50 degrees. In Dublin, for example, latitude 53° 23′, the mean temperature is about 50°.

The general principle, therefore, that the temperature of a place is in proportion to its latitude or distance from the equator, is subject to great modifications. If a place is situated in mountainous or elevated regions—or in the proximity of unreclaimed countries or frozen seas, it will be found much colder than its latitude or distance from the equator would lead us to expect. But if, on the other hand, a place is in the vicinity of parched and sandy deserts, or in sheltered and sunny valleys, its temperature will be much higher than its distance from the equator would lead us to infer.

The city of Quito, for instance, though in the middle of the torrid zone, enjoys a cool and agreeable climate—in fact, a climate not warmer than the ancestors of the present inhabitants were accustomed to in Spain, the nearest part of which is 36° from the equator. The moderate temperature of Quito is owing to the elevation of the plain[a] in which it is situated, and to the cooling effects produced by the snow-capped mountains which encompass it; as Chimborazo, Cotopaxi, &c.

The *northern* parts of North America and of Asia are

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[a] *Quito* is upon a plain which is upwards of 9,000 feet above the level of the sea; and within view of the city there are eleven mountains whose summits are covered with perpetual snow.

instances of the chilling effects produced by sterile soils—proximity to frozen seas—and exposure to cold bleak winds.[a]

On the other hand, the north of Africa, the south of Europe, the Mediterranean Sea, Syria, and Asia Minor, in consequence of the heating effects produced by their proximity to the burning deserts of Africa and Arabia, have a much higher temperature than their respective latitudes would lead us to expect.

Periodical and *prevailing winds* have a great effect upon climate. When they come from *warmer* regions, they increase the temperature of the countries over which they pass; and when they come from *colder* regions, they diminish the temperature in proportion. And hence, also, in countries and places which are exposed to prevailing winds from oceans or extensive seas, the climate is usually moist or humid, while winds from continental regions produce the opposite effect.[b]

Large tracts of water, also, have considerable effect upon climate. The temperature of water is much more equable than that of land; and hence, islands and countries adjoining seas, have a much more uniform climate. In summer,

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[a] The *northern* parts of Asia and North America are greatly exposed to the polar winds. There are no mountains to protect them from their influence; and besides, in consequence of their *northern* aspect or declivity, the rays of the sun strike the surface more obliquely.

A declivity *towards the equator* on the contrary, increases the temperature, by presenting the surface more directly to the rays of the sun. "If the sun, when on the meridian, is 45 degrees, for instance, above the horizon, his rays fall *perpendicularly* on the side of a hill facing the south at an equal angle while the plain below receives them at an *angle of* 45 *degrees*. Supposing the north side of the hill to have a similar slope, the rays would run *parallel* to its surface, and their effect be very trifling; but if the declivity were still greater, the whole surface would be in the shade."—*Library of Useful Knowledge.*

Hence in selecting a farm, a field, or a garden, one with a southern, or rather a south-western aspect, should be preferred; because it receives the rays of the sun *more directly*, and during the warmest part of the day. For a similar reason, a farm with a north-eastern aspect should not be chosen. In the Valais, in Switzerland, it is stated, that the Alps are, on the north and north-eastern sides, covered with perpetual snow, while vineyards and orchards flourish on the opposite sides. And we have all felt how much warmer the south side of a hill is than the northern, or north-eastern side.

[b] "In the United States, the winds often produce, alternately, the cold of the polar regions, and the warmth of the Gulf of Mexico—the moisture of the ocean, and the dryness of the land."—*Woodbridge's Geography.*

their temperature is lower, and in winter higher, than their respective latitudes would lead us to expect; and hence, the difference between an *insular* and *continental* climate, though equally distant from the equator. For instance, though Edinburgh and Moscow are nearly in the same latitude, their climates are very different. In Edinburgh, the heat of summer and the cold of winter, are modified by its insular position, and its general temperature is, in consequence, much more equable than that of any place in the same latitude having a continental situation. In Moscow the cold in winter is sometimes so intense as to freeze quicksilver, and in summer the days are often as hot as at Naples. Compare the difference between the *winter* and *summer* temperatures of Moscow and Edinburgh, and also of Warsaw and Dublin, as given in the table, page 63.

Except in a general sense, therefore, the climate or general temperature of a place cannot be determined by its distance from the equator. To know it accurately, we must be made acquainted with its particular situation and the local influences to which it is subject.

ISOTHERMAL, ISOTHERAL, AND ISOCHIMENAL LINES.

To give a more distinct view of the distribution of heat over the globe, the celebrated traveller Humboldt, from observations and experiments made by himself and others in different parts of the world, traced a number of ISOTHERMAL[a] LINES, that is, lines of equal heat. Through several places supposed to have the same temperature, both in the Old and New World, these lines have been traced, their direction having been determined rather by the growth of particular plants, than by the thermometer, which is a less practical, and perhaps a less certain criterion of general temperature. A few of these lines, particularly such as are distinguished by the growth of important plants and vegetables, we shall now describe.

For 20 degrees on each side of the equator, the isothermal lines, generally speaking, coincide with the parallels of latitude. But in higher latitudes, where the causes which modify climate have greater effect in consequence of the diminished influence of the sun, the course of the isothermal

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[a] *Isothermal.*—From the Greek words ISOS, *equal*, and THER'ME, *heat* or temperature.

lines becomes very irregular. From what we have already said, it is evident that an isothermal line of any given temperature will recede farther from the equator in Europe, than it will either in America or Asia: and that even in passing through Europe, its course will not coincide with a parallel of latitude. In passing through the maritime parts of Europe and the adjacent islands, it will recede farther from the equator, than either in the continental parts, or in elevated regions.

The mean temperature of the earth at the equator is estimated by Humboldt to be about 81 degrees of Fahrenheit's scale; and at 20 degrees north and south of it, the mean temperature, according to the same authority, is about 78°. The isothermal line, therefore, of 78°, is nearly coincident with the parallel of 20° of latitude in each hemisphere. This line of temperature (78°) may be regarded as the northern and southern boundaries of the *spices*, and other delicate productions of the torrid zone.

The isothermal line of 68° coincides nearly with the northern limit of the *sugar-cane* and *coffee-tree*. In North America, this line, generally speaking, is about 31° distant from the equator; while in Europe, the Mediterranean, Asia Minor, and Syria, it recedes about 6° farther north, that is, to latitude 37°. But on reaching Persia, it descends again to 31°; and as it proceeds through the mountainous and elevated regions of Asia, it approaches the equator still more nearly.

The isothermal line of 59° coincides nearly with the northern boundary of the *olive* and the *fig*. This line of temperature, generally speaking, passes through America in latitude 36°, through Europe in 44°, and through Asia, in from, perhaps, 40° on the west, to 35° in the central and elevated parts.

The isothermal line of 50° coincides nearly with the northern limit of the *wine-grape*. In the middle of Europe it corresponds with the parallel of 50°; on the coast, it recedes to about 52°; and in England and Ireland, the same mean temperature is found a degree farther from the equator. In America, this line of temperature strikes the eastern coast in latitude 43°, and the western,[a] in perhaps 50°; but in Asia, it is found as low as the parallel of 40°.

[a] In the northern hemisphere, the temperature is, generally speaking, *lower* on the *east* side of both the old and new continents, than it is on the west. Humboldt, generalizing this fact, has inferred, that all continents and large islands are warmer on the west side than on the east.

The isothermal line of 41° is nearly coincident with the northern boundary of the *oak* and *wheat*. The last oaks are found on the coast of Norway, in latitude 63°; in Russia at 58°; and in Siberia still lower. In North America this line strikes the eastern coast in latitude 49°, but on the western it ascends higher.

The isothermal line of 32° (the point at which water freezes), passes from Ulea in Lapland, latitude 66°, to Table Bay, in Labrador, latitude 54°. North of this line, cultivation, except in sheltered and sunny valleys, is scarcely attempted;[a] and the *fir*, *pine*, and *birch trees* begin to dwindle and disappear. The birch,[b] the hardiest of trees, ceases to grow in latitude 70°; and *shrubs*, *lichens*, and *mosses* succeed. Beyond this the surface is covered with perpetual snow: but even in the middle of perpetual snows, a kind of vegetation is said to exist.[c]

The isothermal lines which have been described, divide the earth's surface, in each hemisphere, into SEVEN VEGETABLE zones or regions. 1. The region of the *spices*, which is a regular zone, extending 20° on each side of the equator. The mean temperature of this region varies from 81° in the middle, to 78° on the northern and southern borders. 2. The region of the *sugar-cane*, in which the mean temperature ranges from 78° on the *equatorial* border to 68° on the opposite. 3. The region of the *olive* and *fig*, which comprises all those parts of the earth's surface where the mean temperature ranges from 68° to 59°. 4. The region of the *wine-grape*, which is comprised between the isothermal lines of 59 and 50 degrees of mean temperature. 5. The region of the *oak* and *wheat*, which lies between the isothermal lines of 50 and 41 degrees of mean temperature. 6. The region of the *fir*, *pine*, and *birch*, which is comprised between the isothermal lines of 41 and 32 degrees of mean temperature.[d] 7. The

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a The hardier grains, as rye, oats, and barley, are raised in valleys having a southern aspect, as high as the 70th degree of latitude, on the coast of Norway; while on the opposite coast of America, such cultivation ceases at the 52nd.

b The *fir* is found in Europe as far north as the 67th parallel, and the *pine* reaches to the 68th.

c The *palmella nivalis*.

d "In Lapland there are pine forests on the continent at Enontekeis, where the mean annual temperature is only 27 degrees; while on the island of Mageroe, where it is more than 32 degrees, only a few scanty

region of the *lichens* and *mosses*, which are found after every other species of vegetation ceases.

Of course, it is not to be supposed that the plants and vegetables here specified are confined to the regions which have been called by their names. All that is meant is, that, as they respectively require a certain temperature to bring them to maturity, we are to expect them, *in perfection*, in those parts of the earth only in which the specified temperature is found.

In ascending a lofty mountain, particularly in a warm country, we may expect to meet with the plants and vegetables of different climates, as the temperature in such cases is generally found to decrease in proportion to the elevation of the surface.[a] If the mountain be near the equator, about its base we may expect to find the *aromatic* trees of the torrid zone; on its sides, the *sugar-cane* and *coffee-tree* of the tropics; higher up, the *olive* and *fig* of Spain, Italy, and Turkey; higher still, the *vines* of France and Germany; next, the *oaks*, *elms*, and *beeches* of England and the north of Europe; next, the *firs* and *pines* of Scotland and Scandinavia; and lastly, the *lichens* and *mosses* of Lapland. Of course, such a regular succession of VEGETABLE ZONES is not to be expected; but, generally speaking, a lofty mountain, in a warm region, will, from its base to its summit, exhibit the appearances of different zones and climates. On the Peak of Teneriffe, Humboldt met with, and has described five of such zones. And "Tournefort, about the base of Mount Ararat, found the ordinary plants of Armenia; a little way up, those of Italy; higher again, those which grow about Paris; afterwards, the Swedish plants; and higher still, those of Lapland." And Etna has been often described by travellers as exhibiting from its base to its summit the extremes of climate and vegetation.

We have now to explain what is meant by *Isotheral* and *Isochimenal* lines. Isothermal lines indicate the mean annual temperature of the places which they pass through; but as

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shrubs are to be seen. The more vigorous vegetation of Enontekeis, is the effect of a warmer summer; the mean temperature of July being there 59$\frac{1}{3}$°, whereas at the isle of Mageroe it is only 46$\frac{3}{4}$°."—*Library of Useful Knowledge.*

[a] The temperature of the air is found, generally speaking, to be about 1° lower for every 330 feet of elevation.

two places on the same isotherm may differ very much in their temperatures during the summer and winter months, it is necessary, in order to have a more correct idea of their climates, to know their mean summer and their mean winter temperatures also. For example, the mean annual temperatures of London and New York are nearly the same, namely 51°; but their mean summer and mean winter temperatures are very different. In London, the mean summer temperature is about 63°, and the mean winter, about 39½°; while in New York, the former is about 71°, and the latter about 30°. In London, therefore, the climate is much more equable than in New York.

Hence it has been proposed to show upon maps the mean summer, and the mean winter temperatures of places, as well as their mean annual temperatures; and in the same way, namely, by means of connecting lines. Such lines are called *Isotheral*[a] when they are drawn through places whose mean summer temperatures are equal; and *Isochimenal*[a] when drawn through places whose mean winter temperatures are equal.

Generally speaking, the difference between the mean summer and mean winter temperatures of places increases as the distance from the equator. In the torrid zone the temperature varies very little throughout the year, and the summer may be said to be perpetual. In some places near the equator, the difference between the temperature of the warmest month and the coldest—if coldest it can be called—does not amount to more than two or three degrees. In Singapore, for example, the difference is only about 2°; at Trincomalee, 6°; and at Madras, 9°. But in the frigid zones, and in those parts of the temperate zones which lie near them, the difference between the mean summer and mean winter temperatures is very striking. In Melville island, for example, the difference is 65°; at Quebec, 54°; and at St. Petersburgh, 43°.

In illustration of the subject, we shall add, in tabular form, the mean summer, winter, and annual temperatures of a few places of note in different parts of the world.

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[a] *Isotheral* from the Greek words ISOS, *equal*, and THEROS, *summer*; and *Isochimenal* is from the same root, and CHEIMŌN, *winter*.

TEMPERATURES OF IMPORTANT PLACES IN DIFFERENT PARTS OF THE WORLD.

Name of Place.	Latitude.	Mean Summer Temperature.	Mean Winter Temperature.	Annual Temperature.
	° ′	°	°	°
London, ...	N. 51 30	63	39½	51
Dublin, ...	„ 53 23	60	40	50
Edinburgh, ...	„ 55 57	57	38	47
Paris, ...	„ 48 50	64	38	51
Vienna, ...	„ 48 12	69	32	51
Berlin, ...	„ 52 31	64	31	48
Copenhagen, . . .	„ 55 41	62	31	46
Stockholm, ...	„ 59 21	60	26	43
St. Petersburgh, . .	„ 59 56	61	18	39
Moscow, ...	„ 55 45	64	15	40
Naples, ...	„ 40 52	75	48	62
Rome, ...	„ 41 54	74	47	61
Madrid, ...	„ 40 25	76	43	59
Constantinople, . .	„ 41 0	71	41	56
Jerusalem, ...	„ 31 47	74	50	62
Calcutta, ...	„ 22 33	86	72	82
Bombay, ...	„ 18 56	83	77	81
Pekin, ...	„ 39 54	75	28	53
Canton, ...	„ 23 8	82	54	69
Hobart Town, . . .	S. 42 53	63	42	52
Auckland, ...	„ 36 51	67	51	59
Cairo, ...	N. 30 2	85	58	72
Cape of Good Hope, .	S. 34 11	74	58	66
New York, ...	N. 40 49	71	30	51
New Orleans, . . .	„ 40 42	82	55	69
Rio Janeiro, . . .	S. 22 54	79	68	73
Quebec, ...	N. 46 49	68	14	41
Toronto, ...	„ 43 40	65	25	45
Melbourne, ...	S. 37 42	65	48	57
Sydney, ...	„ 33 51	74	55	65
Jamaica, ...	„ 18 0	81	76	78
Warsaw, ...	N. 52 13	63½	24½	44

THE SNOW-LINE.

We shall conclude the subject of temperature with a few observations on the SNOW-LINE. The snow-line, or *the line of perpetual congelation*, is the imaginary line which marks the height at which *perpetual snow* begins. The height of this line depends upon the latitude, and the other circum-

stances which affect and modify temperature. Generally speaking, it is highest in the torrid zone, from which it gradually descends till it touches the surface in the polar or frozen regions in which the temperature is permanently below 32°.

The following table will give a general idea of the height of the snow-line in different latitudes, in the northern hemisphere, beginning at the equator.

Latitude.	Mean Temperature.[a]	Height in Feet.
0°	81°	16,000
10°	81°	16,500
20°	78°	17,000
30°	71°	14,000
40°	62°	10,000
50°	53°	6,000[b]
60°	45°	5,000
70°	38°	1,000
80°	33°	0

It appears from the foregoing table, which, however, should be regarded only as a general approximation to the truth, that if a person in the middle of the torrid zone is elevated 16,000 feet above the level of the sea, he will find himself, as far as cold and climate are concerned, transported to the frozen regions of the frigid zone. It appears also, which seems rather surprising, that the snow-line is higher at the distance of 20 degrees from the equator, where we would expect it to descend, than it is in the middle of the torrid zone. But the reason of this is obvious. At the equator, the sun is never more than 12 hours above the horizon, while in the vicinity of the tropics, the days, during the summer, are about 13½ hours in length; which, as the sun is vertical, or nearly so, during that period, causes the temperature to be higher than at the equator, and consequently, increases the elevation of the snow-line.

[a] At the level of the sea.

[b] The height of the snow-line in the latitude of the British Islands is about 5,500 feet above the sea-level; but as the highest of our mountains are under this altitude, none of them are covered with perpetual snow.

But why, it may be asked, should the heat decrease in proportion to the elevation of the surface? One would think that it should be warmer at the top than at the bottom of a mountain, seeing that it is nearer to the sun, and more exposed to his rays. But five miles, the height of, perhaps, the highest mountain in the world, amount to nothing when compared to the immense distance of the sun from the earth; and it is well known, that there is often as much, and even more heat from the reflected, than there is from the direct rays of the sun. When the rays of the sun strike upon the earth, they accumulate about the surface;[a] and are thence reflected into the air, and diffused about the objects around. Hence, in valleys and plains, the heat is greater than it is on mountains and elevated surfaces in the same locality. In the one case, the heat accumulates about the surface, and is diffused about the air and the objects near it; while in the other, the heat is reflected into the thin clear air which surrounds the mountains, and is dispersed by the winds which sweep over them before it has time to accumulate.

Generally speaking, we should expect the snow-line to be lower in the southern hemisphere, than in the northern, in equal latitudes, because the southern is colder than the northern hemisphere; but not, perhaps, so much so, as is generally believed. Humboldt says, that near the equator, and indeed through all the torrid zone, the temperatures of the two hemispheres appear to be equal; but that the difference begins to be felt in the Atlantic, about 22° of latitude; the mean temperature of Rio Janeiro and Havannah, places at about an equal distance from the equator (23°), being in the latter instance 76° 4′, and in the former 74° 5′. In Patagonia, between 48° and 52° of latitude, the temperature of the warmest month is said not to exceed 42 degrees; while at Petersburgh, in latitude 60°, it is 66°; and in Van Diemen's Land, the summers are 10 degrees colder than they are in Italy in the same latitude. But, as we are prepared to expect, from what has been said on the difference between an insular and continental climate in the same lati-

[a] The more impervious the surface is to the rays of the sun, the greater will be the reflected heat. Hence, in walking along the paved streets of a town, we feel much warmer than we should if walking through a field in the country. The reflection of the rays from the walls or sides of the houses increases the heat reflected from the street.

tude, the winters are milder in Patagonia and Van Diemen's Land, than they are in the corresponding latitudes in Russia and Italy.

No inhabited land has been discovered in the southern hemisphere beyond 54° or 55° of latitude; while in the northern hemisphere, habitations of men are found beyond the 70th parallel. Snow has been seen to fall at the Straits of Magellan in the middle of summer; and the island of South Georgia,[a] which is about the same distance from the equator to the *south*, as Yorkshire in England is to the *north*, is covered with perpetual snow. Its only plants are lichens and mosses. Compare also, the climate of the Isle of Man.

Three causes have been assigned for the difference in temperature between the northern and southern hemispheres. First, the great disproportion between the water and the land in the southern hemisphere, which causes its climate to differ from that of the northern, in the same way as an insular climate differs from a continental one, in the same latitude. Secondly,[b] as the sun is nearly eight days in the year longer on the northern side of the equator, than he is on the southern, a greater quantity of heat is distributed in the northern hemisphere than in the southern. And thirdly, as almost all the ice that is formed about the south pole escapes, and is carried by the currents towards the equator,[c] the cold which it gives out as it gradually approaches warmer latitudes, cools the atmosphere and lessens the temperature in proportion. The ice from the north pole, of course, has a similar effect upon the northern hemisphere, but much of the ice that is formed there is hemmed in by the land, and prevented from escaping.

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[a] The island of South Georgia is in 54° 5′ S. lat.; and 38° 15′ W. lon.

[b] That portion of the earth's orbit which lies above the sun, or north of the equator, contains about 184°; that under the sun, or south of the equator, about 176°; and hence the sun, in the course of the year, is nearly eight days longer in the northern than in the southern hemisphere. Or, in other words, the time between the vernal and autumnal equinoxes is about seven days seventeen hours longer than the period between the latter and the former. This arises from the *elliptical* form of the earth's orbit and from the earth's being in *aphelion* in summer.

[c] In 1854, an iceberg was met with in the Southern Ocean which was estimated to be 50 miles long, 4 miles broad, and 150 feet high.

CHAPTER VI.

MOUNTAINS AND TABLE-LANDS.

At first view, MOUNTAINS appear to be irregularities on the earth's surface; but a little consideration will convince us that they were destined to perform an important part in the economy of nature. Their beneficial effects upon *climate* and *vegetation*, in countries exposed to a vertical sun, we have already spoken of; and we have now to add, that mountains form an essential part of the *aqueous* machinery of nature, by which the earth is refreshed and fertilized. Mountains intercept the clouds in their passage through the air, and by attracting, condense and cause them to fall, in rain, hail, or snow, according to the temperature and state of the atmosphere. All the moisture produced in this way penetrates through the pores and fissures of the mountains, and is collected in subterranean cavities and internal reservoirs; and hence the origin of springs, brooks, and rivers. For when these subterranean reservoirs overflow, the water issues out in springs, which, following the declivity of the ground, unite their streams with others, and thus gradually swell into brooks and rivers. If there were no such elevations on the earth's surface, the moisture deposited upon it by the process of evaporation would in dry and sandy soils be entirely absorbed; while in others, it would saturate the surface, and produce swamps and morasses.

Again, without mountains, the mineral treasures of the earth would have been beyond the reach of man.

"If," as has been said, "the strata of the earth had enveloped it like a shell, or to use a familiar example, had they surrounded it like the coats of an onion, it is clear that we should never have become acquainted with any other than the upper members of the series; and that the beds of coal and salt, and the ores of the metals, all of which are confined to the inferior strata, could never have been made available for the purposes of man."

Now, the mountains, those great eruptions of nature, have, by breaking up the crust of the earth, and by displacing the upper strata, brought within the reach of man those mineral treasures to which otherwise he never could have penetrated.

The novelty and beauty given to the landscape, by the varying form and diversified scenery of hill and dale, and mountain and valley, are too obvious to dwell upon. How different would the face of nature be, if the surface of the earth were one unbroken and monotonous plain!

We shall conclude our observations upon mountains, by directing attention to the following excellent article on this subject from a popular publication:[a]—

"The hills are the bones of a country, and determine its form just as the bones of an animal do. For according to the direction of the hills, must be the course of the rivers. If the hills come near the sea, it makes the rivers very short, and their course very rapid; if they are a long way from the sea, it makes the rivers long and gentle. But rivers of the latter sort are generally navigable, and become so large near the sea as to be capable of receiving ships of large size. Here then towns will be built, and these towns will become rich and populous, and so will acquire popular importance. Again, on the nature of the hills depend the mineral riches of a country; if they are composed of granite or slate, they may contain gold, silver, tin, and copper; if they are composed of the limestone of Derbyshire or Durham, they are very likely to have lead mines; if of the sand or gritstone of Northumberland, Lancashire, and Yorkshire, it is probable that there will be coal at no great distance. On the contrary, if they are made up of the yellow limestone of Gloucestershire, Oxfordshire and Northamptonshire; or of chalk, like the hills in Wiltshire, Berkshire, and Hampshire; or of clay, like those about London; it is quite certain that they will contain neither coal nor lead, nor any valuable mineral whatsoever. But on the mineral wealth of a country, and particularly on its having coal or not having it, depends the nature of the employment of its inhabitants. Manufactories are sure to follow coal; whereas in all those districts of England where there is no coal, that is, in all the counties to the south-east of a line drawn from the Wash in Lincolnshire to Plymouth, there are, generally speaking, no manufactories, but the great bulk of the people are employed in agriculture.

"Thus, then, on the direction and composition of the hills of a country, depend, first of all, the size and character of its rivers. On the character of its rivers depend the situation and importance of its towns, and its greater or less facilities for internal communication and foreign trade. And again, on the composition of the hills, depend the employment of the people, their number on a given space, and in a great degree their state of morals, intelligence, and political independence."

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[a] The *Penny Magazine*.

To facilitate the study of this important branch of Geography, we have arranged and CLASSED the principal mountains of the globe, in the order of their height, according to the best and most recent authorities; and with this view we have also given a brief sketch of the principal mountains in the four great divisions of the world.

MOUNTAINS IN THE ORDER OF THEIR HEIGHT.[a]

Ten Classes.

FIRST CLASS.—Mountains 20,000 feet above the level of the sea, and less than 30,000. This class comprises a large number of the Himalayan Mountains, and a few of the Andes. The highest of the Himalayan Mountains are Mount Everest (lat. 28° N., long. 86° E.), 29,002 feet; Kunchin-junga, 28,177; Dhawalagira, or the *White* Mountain, 26,460; Juwahir, 25,670; Jumnautri, 25,500; Chumalari, 23,946. And the more elevated of the Andes are Aconcagua, 23,910 feet; Sahama, 22,350; Chimborazo,*[b] 21,464; Sorata, 21,286; and Illimani, 21,145.

SECOND CLASS.--Mountains 15,000 feet high, and less than 20,000; as the highest summits of the Hindoo Coosh, or Indian Caucasus, nearly 20,000 feet; the highest summits of the Kuen-luen Mountains, nearly 20,000 feet; Cayambe, 19,600; Antisana,* 19,000; Cotopaxi,* 18,889; Elburz (Caucasus), 18,000; Popocatapetl,* 17,770; Mount St. Elias,* 17,500; Mount Ararat, 17,260; Picchinca,* 15,976; Mount Brown, 15,990; Mount Hooker, 15,500; Mont Blanc, 15,730; Monte Rosa, 15,150.

THIRD CLASS.—Mountains 12,000 feet high, and less than 15,000; as Mont Cervin, 14,837 feet; Mount Fairweather,* 14,750; Mount Furka (Helvetian Alps), 14,037; Finster-aar-horn, 14,100; Jungfrau, 13,720; Schreck-horn, 13,386; Mont Iseran (Graian Alps), 13,274; Ortler Spitz (Rhætian Alps), 12,852; Gross Glockner, or the Great Bell (Noric Alps), 12,431; Mont Viso, 12,586; Mount Erebus* (South Victoria), 12,400; the highest peaks of the Abyssinian Mountains, from 12,000 to 13,000; Peak of Teneriffe,* 12,236; Wetter-horn (Bernese Alps), 12,210.

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[a] By the height of mountains is usually meant their perpendicular elevation above the sea level. With regard to the elevation of several of the following mountains, the authorities differ. This is not surprising, as, with few exceptions, it is only in Europe that accurate measurements have been taken. And with regard to the highest mountains, it would be impossible to determine how much of their elevation is due to the condensed masses of snow which have accumulated on their summits since the world began.

[b] The mountains thus marked (*) are volcanoes.

FOURTH CLASS.--Mountains 10,000 feet high, and less than 12,000; as Monte Leone or the Simplon (Pennine Alps), 11,551; Mont Cenis, 11,460; Great St. Bernard (Pennine Alps), 11,063, Mulhacen, 11,657; Maladetta, 11,426; Miltsin, 11,400; James' Peak, 11,320; Mont Perdu, 11,000; Etna,* 10,874; Mount St. Gothard, 10,595; Mount Hermon, 10,000.

FIFTH CLASS.—Mountains 8,000 feet high, and less than 10,000; as Poyana-Ruska (Carpathian), 9,912 feet; Mount Olympus (now Lacha), 9,754; Monte Corno (Apennines), 9,521; Mont Egmont, 8,800; Monte Rotondo (Corsica), 8,763; the highest peaks of the Neilgherry Hills (Hindostan), 8,760; Peak of Lomnitz (Carpathian), 8,000; Mount Taurus, 8,000; Parnassus, 8,000.

SIXTH CLASS.—Mountains 6,000 feet high, and less than 8,000; as Shnee-häetten (Dovre-field), 7,620; Sierra[a] d'Estrella (Portugal), 7,524; Adam's Peak (Ceylon), 7,500; Mount Sinai, 7,489; the highest peak of the Blue Mountains (Jamaica), 7,227; the highest peaks of the Western Ghauts, from 7,000 to 8,000; the highest peaks of the Altai Mountains, 7,000; Snæfel (Iceland), 6,882; Mount Washington (Alleghany), 6,234; Puy de Sancy, summit of Mont Doré (Auvergne), 6,221.

SEVENTH CLASS.—Mountains 5,000 feet high, and less than 6,000; as Mont Mezin (Cevennes), 5,819; the highest peaks of the Ural Mountains, 5,400; Mount Ida, 5,800; Mount Hecla,* 5,210; Mount Pelion, 5,200.

EIGHTH CLASS.—Mountains 4,000 feet high, and less than 5,000; as Mount Helicon, 4,963 feet; Ben Macdhui (Grampians), 4,413; Ben Nevis, 4,350; Mount Otter (Alleghany), 4,260; Cairn Gorm. 4,050.

NINTH CLASS.—Mountains 3,000 feet high, and less than 4,000; as Ben Lawers (Grampians), 3,571; Vesuvius,* 3,972; Table Mountain (Cape of Good Hope), 3,816; Snowden, 3,571; Magillicuddy's Reeks (Ireland), 3,410; Ben Lomond, 3,175; Skaw Fell, 3,166; Mount Brandon (near Dingle Bay), 3,120; Helvellyn, 3,055; Skiddaw, 3,022; Lugnaquilla (Wicklow Mountains), 3,039.

TENTH CLASS.—Mountains under 3,000 feet high; as Arran Fowdy (Cambrian), 2,955; Cader Idris, 2,914; Cross Fell, 2,901; Beacon Hills (Brecknockshire), 2,862; Slieve Donard (Mourne Mountains), 2.796; Mangerton (Killarney), 2,754; Diana's Peak (St. Helena), 2.692; Plinlimmon, 2,463; Whernside, 2,384; Ingleborough, 2,360; Mount Carmel, 2,200; Mount Tabor, 2,000; The Sugar Loaf (Wicklow), 1,651; the Rock of Gibraltar, 1,439.

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[a] *Sierra.*—This term has been applied by the Spanish and Portuguese to mountains whose summits or peaks resemble the teeth of a *saw*, the Latin of which is *sierra.*

REMARKABLE ELEVATIONS.	Feet above sea-level.
Highest ascent in a Balloon, (M. M. Biot, and Gay Lusac, at Paris, in 1804,)	22,900
Highest flight of the Condor, on the Andes, . .	21,000
Elevation attained by M. Boussingault, and Colonel Hull, on Chimborazo, in 1831, the greatest terrestrial height yet accomplished by man, ...	19,689
Elevation attained by M.M. de Humboldt and Bonpland, on the same mountain, in 1803, . . .	19,332
The farm of Antisana, on the Andes, the highest place inhabited by man, ...	13,500
Highest pass over the Himalaya Mountains (Karakorum), ...	18,600
Highest pass over the Andes (Rumihuasi), . .	16,160
Highest pass over the Alps (Mont Cervin), . .	11,000
The Stelvio Pass (Rhætian Alps), the highest carriage road in Europe, ...	9,110
City of Potosi, in Bolivia, ...	13,330
City of Quito, in Ecuador (South America), . .	9,600
City of Santa Fe' de Bogota, in New Granada, .	8,730
City of Mexico (Mexico), ...	7,520
Lake Titicaca, in Bolivia, ...	12,795
Convent of Great St. Bernard (Pennine Alps), . .	8,200
Convent of St. Gothard (Helvetian Alps), . .	6,808
The Great Pyramid (that of Cheops), the highest work of man, ...	480

THE PRINCIPAL MOUNTAINS OF ASIA.

The principal mountains of Asia are the HIMALAYAS.[a] They extend along the whole of north of Hindostan, from the Indus to the Brahmapootra, a distance of about 1,500 miles; and the average breadth of the regions which they occupy varies from 100 to 350 miles. In some places they consist of two or more ranges of different degrees of elevation, with occasional spurs or small branches in transverse directions; and in others they occur in detached groups, or chaotic masses rising one above another. Upwards of fifty of them, it has been computed, are from 18,000 to 20,000 feet above the level of the sea; while there are several others of a still higher elevation. The summits of these stupendous mountains are covered with eternal snow; and to the Hindoo, viewing them from the burning plains below, they have always been objects of wonder and religious veneration.

[a] *Himalaya.*—In the Sanscrit, or ancient language of India, the term *Himalaya* means *snow* or *snowy*. To this circumstance Pliny alludes when he says, "*Imaus* incolarum in lingua *nivosum* significante." Mount *Hæmus* seems to owe its name to the same circumstance. Compare also Sierra *Nevada*, Mont *Blanc*, and Dhawala Gira or the *White* Mountain.

In the vast regions of the Himalayas there is found every variety of surface, soil, vegetation, and climate; as steep and gradually sloping declivities; high and arid plains; deep and fertile valleys; low and pestilential swamps; dense jungles, and immense forests. And, as we should expect in such regions, the most striking diversities of scenery, vegetation, and climate are often found in close proximity. Thus, in the fertile and beautiful valleys of Cashmere and Nepaul the flowers and fruit of the tropics are found almost side by side with the productions of the temperate zones; while the snows of the Arctic regions are seen in the distance on the summits of the lofty Himalayas.

Mountains which skirt or border on table-lands are higher on one side than the other, and hence the altitude of those of the Himalayan mountains which are so situated is higher on the southern side than on the northern. This is particularly the case on the borders of the high table-land of Tibet, which, in some cases, is upwards of 15,000 feet above the level of the sea. But even if 15,000 feet were deducted from the most elevated of the Himalayan Mountains, their summits would still be from 10,000 to 13,000 feet above the highest of the table-lands from which they rise or on which they border.

It is also remarkable that the snow-line is higher on the *northern* side of the Himalayas than it is on the southern. This is the reverse of what we should expect; but it is the result of local influences, such as the radiation of heat from the high table-lands below, which, during the summer months, are much hotter than their distance from the equator would lead us to expect.[a] But on the south side of the mountains the descent is by successive terraces or gradual declivities, to low alluvial plains, which are not more than 1,200 feet above the level of the sea. These plains, through which the waters of the Ganges and Brahmapootra flow, are, to a great extent, covered with swamps, jungles, and forests, all of which tend to cool and moisten the atmosphere on the southern side of the Himalayas, as compared with their northern side.

The passes of the Himalayas, of which there are several, are of an amazing elevation. The Pass of Karakorum is 18,600 feet above the level of the sea; Parangla, 18,500; Doora Ghaut. 17,750; and Doora Ghaut, 16,814. The difficulty of these ascents is immense, particularly that of the Doora Ghaut, which leads to the sacred lake of Tibet. There are other passes much less elevated, but they are nearly all too difficult for the usual beasts of burden, and in such cases *sheep* are frequently employed instead.

The Altaï Mountains commence near the sources of the river Irtish, and extend in an easterly and north-easterly direction, across the whole continent, to the shores of the Sea of Okhotsk; but in the eastern part of their course they are called by different names; as

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[a] See page 58.

the *Aldan* and *Yablonoi* Mountains. These mountains form the entire line of separation between the Chinese Empire and Asiatic Russia or Siberia. The extent of the whole range is nearly 5,000 miles; and the average elevation of the mountains is about 5,000 feet above the level of the sea. The highest known summit is *Bialukha*, near to the head of the Obi. It is about 11,000 feet high. From the Sea of Okhotsk, north of the Yablonoi range, the *Stanovoi* Mountains extend to Bhering Straits.

Between the Himalaya and Altaï Mountains, and nearly in parallel directions, are two other high and extensive ranges, namely, the *Kuen-lun* or *Quan-lun*, and the *Thian-shan* or Celestial Mountains. The Kuen-lun range separates Tibet from Chinese Tartary, and the Thian-shan runs through Chinese Tartary and Mongolia. Several of the summits of both ranges are considerably above the snow-line; and some of the peaks of the Kuen-lun Mountains are supposed to be from 15,000 to 20,000 feet high. To the eastward of these ranges are the mountains of China, of which little is known.

The Beloor-tagh range extends northward from the Hindoo-Koosh, or Indian Caucasus, to the Thian-shan Mountains, forming the boundary of the south-west part of the high table-land of Central Asia. Its highest summits are from 15,000 to 18,000 feet above the level of the sea.

The Hindoo-Koosh Mountains extend in a westerly direction from the valley of the Upper Indus, which separates them from the Himalayas, to the Paropamisan range. These mountains form the boundary between Afghanistan and Independent Tartary; and several of their summits rise considerably above the snow-line. The highest mountain of the range is the *Hindoo-Koh*, which is eighty miles north from Cabool. Its estimated height is about 20,000 feet.

Westward of the Hindoo-Koosh Mountains is the *Paropamisan* range; and still further to the west the mountains which skirt the northern side of the high table-land of Iran or Persia. In the western part of their course, along the southern shores of the Caspian Sea, these mountains are called the *Elburz*[a] range. Mount Demavend, the highest of the range, is about 15,000 feet above the level of the sea.

The *Caucasus*, or range of mountains so called, extend in a north-westerly direction between the Caspian and Black Seas. The *Elburz*,[a] near the centre of the range, is the highest summit. Its height is 18,493 feet above the level of the sea. This range of mountains forms part of the boundary between Asia and Europe.

Of the mountains on, or which border on, the high table-land of Armenia, Mount *Ararat* is the most elevated. It stands by itself in

[a] *Elburz.*—This seems to have been a generic term, perhaps meaning *snowy*. See note on Himalaya, p. 71.

the middle of a vast plain, from which it rises majestically to the height of 17,260 feet above the level of the sea. It terminates in two conical peaks—*Agra-dagh* and *Allah-dagh*, the former of which is covered with perpetual snow, but from the latter, which is much less elevated, the snow sometimes disappears. This mountain is held in great veneration, from its being believed to be the Mount Ararat of Scripture on which the Ark rested after the Flood. The Armenians call it "the mountain of the Ark," and the Persians, "the mountain of Noah."

Still further to the west are the ranges of *Mount Taurus* and *Anti-Taurus*. The former extends along the southern coast of Asia Minor, and the latter is more inland, and much less extensive The average height of these mountains is from 4,000 to 5,000 feet; but *Arjish-dagh*, the ancient *Argæus*, is 13,100 feet high: it is in the Anti-Taurus chain. According to ancient geographers, both the Mediterranean and Euxine Seas can be seen from its summit.

The Mountains of *Lebanon*, which were formerly so celebrated for their cedars, commence at the south of the eastern extremity of the chain of Mount Taurus, and extend along the greater portion of the coast of Syria. The *Anti-Libanus* is more inland; and between it and the principal range is a low valley, which was called by the ancients *Cœle-Syria*, that is, *hollow* or *low* Syria. *Mount Hermon*, of the Anti-Libanus range, is the highest of the Mountains of Lebanon. It is near the source of the Jordan, and its height above the level of the sea is about 10,000 feet.

South of the Lebanon ranges are the *Mountains of Judah*; and still further south, the *Mountains of Seir*, which terminate in *Mount Sinai*, at the extremity of the small peninsula at the head of the Red Sea, between the Gulf of Suez and Akabah. On Mount Sinai the Lord delivered the Ten Commandments to Moses; and the natives, with reference to this great event, call it *Jeb-el-Mousa*, or the *Mountain of Moses*. Mount Horeb, on which Moses saw the burning bush, adjoins Mount Sinai. Amid these mountains, and the adjoining deserts, the Israelites sojourned for forty years in passing from Egypt to Canaan, or the Land of Promise.

We have now traced the course of the principal mountain-ranges of Asia, and it is worthy of remark that they all, with few exceptions, run in the direction of the *breadth* of the continent, that is, *east* and *west*; and, generally speaking, the same observation is applicable to the principal mountain-ranges of Europe and Africa, particularly to those of the former. But with regard to the New World it is quite the reverse. The great mountain-ranges of North and South America run in the direction of the *length* of the continent, that is, *north* and *south*.

THE PRINCIPAL MOUNTAINS OF AMERICA.

The ANDES or CORDILLERAS[a] of the ANDES are the principal mountains of America. They extend along the whole western coast of South America, from the Isthmus of Panama to the Straits of Magellan, a distance of about 4,400 miles; and the average breadth of the regions which they occupy—except in Bolivia and Patagonia—is from 200 to 250 miles. In the former the breadth is about 400 miles, and in the latter it narrows to less than 20. The distance of their western ridges from the shores of the Pacific rarely ever exceeds 100 miles; and in the southern part of their course, particularly in Patagonia, they approach the sea so nearly that in many places they actually form the coast-line.

In the elevation of their summits the Andes are inferior to the Himalayan Mountains; but in their immense masses and gigantic proportions, they more than rival them; and with regard to the continuity or length of their ranges, and the extent of the regions which they occupy or influence, there can be no comparison. In fact, the Andes and their subordinate branches give a character to the surface, and influence the climate of a large portion of the South American continent.

In the northern part of their course the Andes form three distinct ranges, the most eastern of which rises on the shores of the Carribean Sea, east of the Lake Maracaybo. At about the 2nd degree of N. lat., the middle and eastern of these ranges unite; and from this to about the 19th degree of S. lat., the mountains run in two parallel chains—the eastern one of which is called the Cordillera Real, and the western the Cordillera of the Coast. Between these ranges is the high table-land of Titicaca, and the large lake of the same name. Southward of this the Andes consists of only one principal range, which gradually narrows till it terminates abruptly at the southern extremity of the continent.

Aconcagua, in Chili (32° 45′ S. lat.), is the highest summit of the Andes; but, with this exception, the most elevated mountains of this system are on, or along the borders of the high table-lands of Quito and Titicaca. On the former, which extends on each side of the equator, are Chimborazo, Cayambe, Antisana, Cotopaxi, and Pichinca; and on, or grouped around the latter, are a large number of mountains from 15,000 to 18,000 feet high, and several still higher, as Sahama, Ancohuma or Sorata, and Illimani. In the most northern and southern portions of their course the height of the Andes is inconsiderable; but in Patagonia there are several lofty peaks.

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[a] *Andes* or *Cordilleras.*—The term *Andes* is derived from a Peruvian word, which means *copper* or *metal;* and, in Spanish, *Cordilleras* signifies *cord*, girdle, or chain.

The Andes are particularly remarkable for the number of volcanoes which they contain. In fact, the whole range seems to rest upon volcanic fires, and numerous peaks are constantly burning. In Chili the number of *active* volcanoes is greater than in any of the other portions of the range; but the most elevated, and by far the most terrific, are in the Andes of Ecuador or Quito. In fact, the highest volcanoes in the world are in this region, as Cotopaxi, Antisana, and Pichinca. Of these Cotopaxi is the most dreaded. It is upwards of four miles high, and in some of its eruptions flames have been known to rise upwards of half-a-mile above its crater; while the roar or sound of its explosions has been heard at the distance of 550 miles. During its eruption in 1803, Humboldt, at Guayaquil, 150 miles distant, heard its roar day and night like the continued discharge of artillery. One of these awful eruptions took place immediately after the invasion of America by the Spaniards, which, it is said, greatly facilitated their conquest of Peru; for the natives, concluding that they had been devoted to destruction by their offended deities, became an easy prey to their cruel and rapacious invaders. At other times this mountain is beautiful to look on. Its form is perfectly conical, and its lofty summit, though almost under the equator, is covered with perpetual snow; and at sunset it is described by Humboldt as shining with a dazzling splendour against the azure vault of heaven.

In no part of the world are earthquakes so frequent and so destructive as in the Andes, particularly in Chili. The cities and towns of Bogota, Quito, Riobamba, Copiapo, Valparaiso, Concepcion, and Callao, have all, at different times, been entirely or partially destroyed by these awful visitations; and on several occasions large tracts of country have been raised or depressed by their agency. In Chili a large portion of the coast-line near Valparaiso was, during an earthquake, permanently raised three feet above its former level.

As the regions of the Andes extend from about the 9th degree of latitude north of the equator to the 53rd south of it, they may be said to pass through every zone and climate into which the earth is divided; for the southern part of Patagonia, in which they terminate, is, as far as coldness and bleakness are concerned, in the polar regions. And in the torrid zone the lofty mountains of the system have such an effect upon the climate of the countries and places connected with them, that the temperature and productions of the other zones are often found under the same parallel, and at no great distance apart. This is particularly the case with regard to the snow-capped mountains of Quito, and the high table-lands which they enclose.

The PASSES of the Andes are nearly as high as those of the Himalayas, and the difficulties and dangers which travellers encounter in making their way through them are perhaps greater. In some places they have to clamber up steep and slippery rocks; in others

they have to make their way along the brink of frightful precipices, where to slip or make a false step would be destruction; and not unfrequently their path is crossed by furious torrents, and yawning chasms hundreds of feet deep. Over them, slung in a kind of hammock, the adventurous travellers are slided or pulleyed from one side to the other. These are called rope-bridges, and by means of them even beasts of burden and other animals can be passed over such places in safety.

The least difficult and most frequented of these mountain-passes is that of Mendoza, or Portillo, by which the communication between Valparaiso on the Pacific, and Buenos Ayres on the Atlantic, is kept up. It is 14,370 feet above the sea, and there are others much higher.

The Rocky Mountains extend from the shores of the Arctic Ocean, west of the mouth of the Mackenzie River, to the Cordilleras of Mexico, a distance of nearly 3,000 miles; and the breadth of the region which they occupy with their ranges, plateaus, and valleys, varies from 40 to 100 miles. From the shores of the Pacific Ocean, to which they are nearly parallel, they are distant several hundred miles.

In the most northern part of their course they consist of several parallel ridges, the elevation of which scarcely ever exceeds 2,000 feet. South of this they proceed in two parallel ranges, with an increasing altitude; but, till they reach the 55th parallel, their highest summits do not exceed 4,000 feet. South of this they attain their highest elevation, which averages from 7,000 to 8,000 feet. Mount Hooker and Mount Brown, in the eastern or principal range, are the highest summits. The former is 15,990 feet above the level of the sea; and the latter 15,500. These mountains are in the British territory, between the 52nd and 53rd parallels; and the next highest summits are Fremont's Peak and James' Peak, in the territories of the United States. The former is 13,568 feet high, and the latter 11,500. In the southern part of their course they are lost among the high plateaus or table-lands of Mexico. But notwithstanding the interruptions which occur, the Cordilleras of Mexico and the Mountains of Central America, and the Isthmus should be considered as connecting the great range of the Rocky Mountains with the still greater range of the Andes. Taking this view, we have one stupendous range of mountains stretching through the whole length of both continents from north to south, a distance little short of 10,000 English miles.

Along or near the coast of the Pacific, from the southern extremity of California to the confines of Russian America, there are successive chains of rugged mountains, which have been called *The Alps of the Pacific*. Some of these chains have particular names; as the *Coast Range* and the *Sierra Nevada*, in California; and the *Cascade Mountains* in Oregon. Several of the mountains in these ranges are

as high as the most elevated summits of the Rocky Mountains, and some of them are even higher, as Mount St. Elias, on the confines of Russian America. This Mountain is upwards of 17,000 feet above the level of the sea; and Mount Fairweather, in the same range, is nearly 15,000. And in the Cascade range, near the Columbia River, are several peaks upwards of 15,000 feet high; as Mount Hood, Mount Vernon, and Mount Jefferson. The Sierra Nevada, as its name implies, is a very lofty range. Its average elevation is about 7,000 feet, and several of its summits are above the snow-line.

The Sierra Nevada is nearly parallel to the Coast Range in Upper California; and between these two ranges is the valley of the Sacramento, which contains the *Gold Regions* of California. And between the Sierra Nevada range and the Rocky Mountains, is the high and remarkable plateau of Utah or the Salt Lake Territory, in which the Mormons or Latter-Day Saints have a settlement. North of the territory of Utah, and in the same elevated belt of country, is the greater portion of Oregon, and also of British Columbia, including the valley of the Fraser River, in which are the recently discovered *Gold Fields*.

The Apalachian or *Alleghany Mountains* extend from the north of the State of Alabama to the Gulf of the St. Lawrence, in a direction nearly parallel to the coast of the Atlantic, that is, from south-west to north-east. The length of the whole range is about 1,500 miles; and the breadth of the region over which they spread is upwards of 100 miles. They consist of several parallel ridges, and they are called by different names, as the Cumberland Mountains in Tennessee, the Catskill in New York, the Green Mountains in Vermont, and the White Mountains in New Hampshire. The *Alleghany* Mountains, though often applied to the whole range, properly belongs to the central and principal range in the States of Virginia and Pennsylvania.

The average height of the Apalachian Mountains is from 2,500 to 3,000 feet. The White Mountains in New Hampshire are the highest. During nine or ten months of the year several of their summits are covered with *snow*, and to this circumstance they owe their name. Mount Washington in this range is the highest. Its altitude is 6,234 feet.

The Ozark Mountains extend in a north-east direction from the Red River, north of Texas, to the confluence of the Missouri with the Mississippi. The length of the range is upwards of 300 miles; and the breadth of the region which they spread over is about 100 miles. They are parallel to the Apalachian Mountains, but they are not connected with them. Their elevation is inconsiderable. their highest summits never exceeding 2,000 feet.

THE PRINCIPAL MOUNTAINS OF EUROPE.

THE ALPS[a] are the principal mountains of Europe, both with regard to the elevation of their summits, and the extent of the regions which they occupy. Regarded as a whole, they form a semi-circular curve round the north of Italy, separating it from France, Switzerland, and Germany. The extent of this curve or course, from the western side of the Gulf of Genoa to the Adriatic coasts, is about 600 miles; and the average breadth of the regions which they spread over is upwards of 100 miles. Since the time of Julius Cæsar they have been divided into several distinct ranges or portions. The following are the usual divisions:—

1. The *Maritime* Alps, from the Gulf of Genoa to Mont Viso,[b] near the sources of the Po. 2. The *Cottian* Alps, from Mont Viso to Mont Cenis. 3. The *Graian*[c] Alps, from Mont Cenis to the Pennine Alps. 4. The *Pennine*[d] Alps, from the great curve or bend in the range to the eastward to Monte Rosa.[e] This range contains the highest mountains of the system; as MONT BLANC,[f] Monte Rosa, and Mont Cervin or the Matter-horn. 5. The *Lepontine* or *Helvetian* Alps, from Monte Rosa to Mont Bernardin, near the sources of the Upper Rhine. 6. The *Rhætian* or *Tyrolese* Alps, from Mont Bernardin to Monte Croce, near the sources of the Piave. 7. The *Carnic* Alps, from Monte Croce to the source of the river Save.

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[a] The term *Alps* is said to be derived from *alb*, a Celtic word, which means *high* or lofty; but as *alb* is evidently from the same root as the Latin *albus*, it is probable that its primary meaning was *white;* and that it was originally applied to high mountains in this sense, that is, to mountains whose summits are covered with perpetual snow. See the note on the term *Himalaya*, p. 71.

[b] *Viso* means *visible* or conspicuous; and the term was applied to this mountain because it can be seen in all directions to a great distance.

[c] *Graian* means *Grecian*, and the term was applied to these mountains from a tradition that Hercules crossed them on his return from Spain into Italy and Greece.

[d] *Pennine.*—From the Celtic *beann*, a high summit or mountain; as in *Ben*lomond, *Ben*more, *Pen*ryhn, &c.

[e] *Monte Rosa.*—This mountain consist of a series of peaks rising from one centre, like the leaves of a *rose*, and hence its name.

[f] *Mont Blanc* has been called "the Monarch of Mountains," and it well deserves the name; for there are few mountains in the world—perhaps none—which have a more majestic appearance. And even with regard to *altitude*, if measured from its base to its summit, or *from the ground on which it stands*, it ranks with the highest mountains in the world. Chimborazo, the giant of the Andes, has a less elevation above the table-land of Quito, from which it rises, than Mont Blanc has above the valley of Chamouni; the height of the former above the plain being 700 feet less than that of the latter above the valley.

To these may be added the *Bernese* Alps and the Alps of *St. Gall*, in Switzerland; and also the *Noric*, *Julian*, and *Dinaric* Alps, which are outlying or terminating ranges.

The Bernese Alps extend along the northern side of the valley of the Upper Rhone, or as it is called in Switzerland, the *Valais*; and the Alps of St. Gall are to the north-west of the valley of the Upper Rhine. Near the eastern extremity of the Bernese Alps, and connecting them with the Lepontine or Helvetian range, is *Mont St. Gothard*, which may be considered as the centre of the whole Alpine system; and on the opposite sides of this mountain, and at no great distance apart, are the sources of the Rhine and the Rhone, which carry their waters to different and far distant seas. The Reuss and the Tessin also rise on opposite sides of the same mountain.

The Noric Alps may be considered as extending from Lake Constance to the Kahlenberg, near Vienna; and the Julian and Dinaric Alps extend in a south-easterly direction from the Carnic Alps to Mount *Dinara*, in Dalmatia.

There is another small range called the *Styrian* Alps. It extends between the Noric and the Carnic Alps.

MONT BLANC, in Savoy, at the head of the Pennine Alps, is the highest mountain of the system. Its elevation above the level of the sea is 15,744 feet; and *Monte Rosa*, and *Mont Cervin* or the *Matterhorn*, in the same range, are the next highest. The former is 15,174 feet high, and the latter 14,839. In the Bernese range, which flanks the opposite or northern side of the valley of the Rhone, the altitude of the principal mountains is not much less; as the *Finster-aar-horn*, the *Jungfrau*, and the *Schreck-horn*, which are respectively 14,100, 13,718, and 13,386 feet high. And in the other ranges of the Alps there are several mountains from 12,000 to 13,000 feet high; and, upon the whole, it may be said that more than twenty of the Alpine mountains are upwards of 10,000 feet above the level of the sea.

The Alps, particularly those portions of them which border on, or which run through Switzerland, are celebrated for the sublimity, beauty, and diversity of their scenery. Many of their summits are covered with perpetual snow, particularly that of *Mont Blanc*, which, though not in Switzerland, is seen from almost every part of it; and, notwithstanding its recent annexation to France, it will still seem to belong to Switzerland, and to accompany the tourist through it wherever he goes.

The Alps are distinguished beyond all other mountains in the world for the number and extent of their GLACIERS or *fields of ice*. There are, it is said, upwards of 400 of them between Mont Blanc and the Tyrol, the united areas of which would form a sea of ice of 1,000 square miles in extent. Some of them are fifteen or sixteen miles in length; but their breadth scarcely ever exceeds one or two miles. With regard to their depth it is difficult to form an estimate; but it

is supposed to vary from 100 to 600 feet. They are very diversified in their form and appearance. In some cases they occur in chaotic masses of snow and ice jumbled together; and in others they assume beautiful and most fantastic forms, which glitter in the sun like the spires and turrets of a city of crystal. Their surface in some places is smooth and unbroken, like that of the sea in a perfect calm; while in others they have such an appearance as the sea would present if, in the middle of a raging storm, its foaming waves were suddenly and permanently frozen. The *Mer de Glace*, which terminates in the *Glacier de Bois*, in the valley of Chamouni, presents such an appearance. In some cases, too, their surface is crossed by frightful chasms, hundreds of feet deep. These chasms or rents are produced by atmospheric changes, and other causes operating from below; and when they take place, the noise which accompanies them is as loud and as terrific as thunder.

The *glaciers* are formed by the partial melting of the snow on the sides of the lofty mountains during summer, which, on the approach of winter, is converted into ice, and accumulated year after year in the deep valleys below. But though they originate about the line of perpetual congelation, they are prolonged much below it, and in some places they extend to the very borders of cultivation. In these cases the contrast between them and the verdure and vegetation in their immediate neighbourhood, is striking and beautiful. But the proximity of the glaciers is sometimes dangerous; for they occasionally break up and descend to the cultivated valleys in the form of the dreaded *avalanche*.

AVALANCHES or *snow-slips* occur in all mountainous regions where snow accumulates, but particularly among the Alps, in consequence of the steepness of their slopes or declivities. They are of various kinds; as the *drift*, the *sliding*, and the *rolling* avalanche. The drift avalanche occurs when large and increasing masses of recent or unconsolidated snow are impelled downwards by strong winds. The sliding avalanche occurs in spring, when the snow next the earth melts, and the whole superincumbent mass of the snow which fell during the winter slides down the steep descent to the valleys below. The rolling avalanche occurs after the thaw, when the particles of snow are strongly adhesive. It commences with a roundish mass, which, having been put in motion—perhaps by its own weight,—rolls down the side of the mountain, increasing in size, velocity, and force at every revolution, till at length nothing can withstand it. These avalanches often overwhelm travellers, and sometimes destroy entire villages. In connexion with avalanches may be mentioned the LAND-SLIPS which occasionally occur in these regions, and which are sometimes equally destructive, and in the same way. On these occasions immense masses of earth, with uprooted trees, and detached rocks, are precipitated into the cultivated valleys below.

There are several passes or roads across the Alps. The highest is that of *Mont Cervin*, but it is not practicable for carriages. It is 11,000 feet above the level of the sea. The *Stelvio Pass*, which leads from the Tyrol into Lombardy over the Rhætian Alps, is the highest carriage-road in Europe! It was constructed by Austria, and opened in 1824. Its elevation is 9,100 feet. The pass of the *Great St. Bernard*, in the Pennine Alps, is 8,150 feet high; and that of the *Simplon*, in the same range, is 6,592 feet. The pass of *Mont St. Gothard*, in the Lepontine or Helvetian Alps, is 6,976 feet high: that of the *Splugen*, in the Rhætian Alps, 6,939 feet; and that of *Mont Genèvre*, in the Cottian Alps, 6,560 feet. But the most frequented of all the Alpine passes is that of *Mont Cenis*, which leads from Savoy to Turin. It is 6,775 feet above the level of the sea. This road, and also that over the Simplon, was constructed by the First Napoleon for military purposes.

The *temperature*, *productions*, and *climate* of almost every country in Europe, from the south of Italy to the north of Norway, may be found in the regions of the Alps. And this striking diversity of productions and climate is often exhibited by one and the same mountain, from its base to its summit. And on the opposite side of the same mountain, and at the same elevation, the climate and productions may be very different. In the *Valais*, for example, there are mountains whose north and north-eastern sides are covered with snow, while vineyards and orchards flourish on the opposite sides.

The Apennines may be regarded as a prolongation of the Maritime Alps. They commence near the head of the Gulf of Genoa, and extend through the whole length of the peninsula, from north to south. In the southern part of their course, about the parallel of 41°, they separate into two ranges, one of which turns off to the Straits of Messina, and the other terminates at Cape Leuca. The mountains of Sicily are a continuation of the former range. They are usually divided into the Northern, the Central, and the Southern Apennines; and the length of the whole range, following its windings, is about 800 miles.

The average elevation of the Northern and Southern Apennines varies from 3,000 to 5,000 feet; but in the Central Apennines several summits rise to the height of 7,000 or 8,000 feet. And Monte Corno, which is in this portion of the range, is 9,521 feet.

Among the detached portions of the Apennines are the mountains of *Piombino*, in Tuscany; *Mont Albano*, near Rome; and *Mount Vesuvius*, in Naples, which is the only active volcano on the continent of Europe.

None of the summits of the Apennines attain the altitude of the snow-line. On Monte Corno, however, the snow lies for nine months of the year.

The sides of the Apennines are, generally speaking, covered with a varied vegetation, of which the orange, citron, olive, and palm

form the lowest zone; but above the elevation of 3,200 feet vegetation is rare.

The Pyrenees form the boundary between Spain and France. The length of the chain, from Cape Creux, on the Gulf of Lyons, to its termination near the shores of the Bay of Biscay, is 270 miles; and the average breadth of the regions which they occupy is between 40 and 50 miles.

In the central part of the chain, several of their summits rise considerably above the snow-line, which is here upwards of 8,000 feet above the level of the sea; and their average elevation is between 7,000 and 8,000 feet. The highest mountains of the system are *Pic Nethou* or *Maladetta*, at the source of the Garonne; and *Mont Perdu*, near the source of the Adour. The height of these mountains is 11,168 and 10,994 feet respectively; and there are several others whose altitude is very little less; as *Pic du Midi*, 9,540, and *Le Canigou*, 9,137 feet.

On the south or Spanish side the Pyrenees are more precipitous, rugged, and difficult of ascent than they are on the north or French side; and the passes through them consist of deep and narrow defiles, with high walls of rocks on each side. But towards the eastern and western extremities of the chain, where the elevation of the mountains is less, and the ascent is more gradual, the passes are comparatively easy.

The southern slopes of the Pyrenees are drained chiefly by the Ebro and its affluents; and the northern or French slopes by the Adour, the Gironde, and the Aude.

In the higher regions of the Pyrenees the climate is very severe, and in some places almost arctic; but in the lower villages it is mild and warm, and the vegetation, including the olive-tree, is most luxuriant. This is particularly the case as regards the eastern part of the chain.

Before their termination westward the Pyrenees throw off a branch chain, which extends along the shores of the Bay of Biscay to Cape Finisterre on the Atlantic—a distance of about 400 miles. These mountains are called by various names; as the *Cantabrian*, the *Asturian*, and the *Galician* Mountains.

There are several other chains of mountains in Spain, which, running generally in an easterly and westerly direction, divide the greater part of the interior of the country into a succession of table-lands or elevated plains. The most southerly and the principal chain is the *Sierra Nevada*, which extends from Cartagena on the Mediterranean, to Cadiz on the Atlantic. Several of its summits, as the name denotes, rise above the snow-line, which is here higher than at the Pyrenees; and its average elevation is between 7,000 and 8,000 feet. *Mulhacen*, its most elevated summit, is 11,657 feet above the level of the sea. It is therefore the highest mountain in Spain.

The snow-covered summits of the Sierra Nevada form a striking and beautiful contrast with the fertile valleys and warm sunny plains below.

North of the Sierra Nevada, and in a direction nearly parallel, are —1. The *Sierra Morena*, between which and the Sierra Nevada is the rich valley of the Guadalquiver. 2. The *Mountains of Toledo*, between which and the Sierra Morena is the valley of the Guadiana. 3. The Sierras of *Guadarama*, *Gredos*, and *Gata*, which separate the basins of the Tagus and Douro. This range is prolonged to Portugal, when it becomes connected with the *Sierra d'Estrella*; and it finally terminates at Cape Roca, the most westerly point of Europe. 4. The *Cantabrian* and *Asturian* Mountains, between which and the Sierras of Guadarama, &c., is the extensive basin of the Douro. The Sierras of Guadarama are also called the *Mountains of Castile*.

The Balkan or *Hæmus Mountains* extend in a westerly direction from Cape Emineh on the Black Sea, to the plain of Sophia, the eastern extremity of which is about the meridian of 23° E. They may, however, in a general sense, be considered as extending to the Dinaric Alps on the shores of the Adriatic. The connecting or intermediate ranges are the group of Tchar-dagh, and the Mountains of Montenegro and the Herzegovina. In this point of view the Balkan range of mountains forms the watershed between the rivers which flow into the Archipelago, and the southern affluents of the Danube.

On their northern side, about the meridian of 23° E., they throw off a branch chain, which extends in a north-west direction, till it terminates abruptly on the banks of the Danube. On the opposite side of the bed of the river the Carpathian Mountains rise as abruptly; and in the narrow defile between them, which is called the Iron Gate, the waters of the Danube flow. This branch is called the *Northern Balkans*; and near their eastern extremity the main chain throws off another branch, which stretches between the Black Sea and the Sea of Marmora to the shores of the Bosphorus. This branch is called the *Little Balkans*. Farther to the west there are other groups or ranges of mountains connected with the Balkans on the southern side; as the Despoto-dagh or Rhodope Mountains; and still farther to the west is the chain of Mount Pindus, with which all the mountains in Greece are more or less connected.

The ancients[a] had a most exaggerated idea of the height of these mountains; but it has been found that few of their summits attain the altitude of 4,000 feet, and that their average elevation is little more than 2,000 feet. They are, however, very rugged and precipitous; and the passes through them are extremely difficult. The Gate of Trajan, by which the communication between Vienna and

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[a] Some of their writers assert that these mountains are so high that the Euxine (Black Sea) and Adriatic can be seen from them at the same time.

Constantinople is kept up, is the easiest and most frequented pass. It is about the meridian of 24° E. But in the groups or ranges connected with the main chain of the Balkans there are several mountains between 7,000 and 8,000 feet high, and some even higher; as Mount Scardus of the Tchar-dagh group, which is about 9,700 feet above the level of the sea.

The Carpathian Mountains rise near Presburg on the Danube, and extend in a semicircular curve round the north and north-east of Hungary, and the east and south of Transylvania, to the banks of the same river near Orsova, where, with the opposite and terminating range of the Northern Balkans, they form the celebrated defile or passage of the Iron Gate. The extent or length of this curve or course is upwards of 800 miles; and the breadth of the regions which they occupy with their ranges, plateaus, and valleys, varies from 20 to 200 miles.

The Carpathians may be divided into three ranges—1. *The Little* Carpathians, which extend from their rise near the Danube to about the meridian of 19° E., near the sources of the Oder and the Vistula. 2. *The Western* Carpathians, which extend from the Little Carpathians to about the meridian of 25° E. This, which is the principal or main range of the Carpathians, separates Hungary on the north and north-east from Galicia and the Bukowina. 3. *The Eastern* Carpathians, which extend from the eastward termination of the Western Carpathians to the Danube, separating Transylvania from the Turkish provinces of Moldavia and Wallachia.

The average elevation of the higher mountains of the system is between 5,000 and 6,000 feet; but in the groups of Tatra, Lomnitz, and Bisztra, which are connected with the Western Carpathians, there are several summits upwards of 8,000 feet high. And in Transylvania, in which there are numerous groups and branches connected with the Eastern Carpathians, there are peaks still higher.

Many of the summits of the Carpathians are of a pyramidal form, and the principal chain has a grand and imposing appearance; but they are in general very rugged and abrupt, and the passes through them are narrow and difficult. On the northern or convex side of the semi-circle they are abrupt and precipitous; but on the opposite side the descent to the great plain of Hungary is gradual and easy. There are many wild mountain districts and picturesque valleys connected with them, particularly in the group of Tatra, which is embraced by the two upper streams of the Waag.

The Carpathians are rich in gold, silver, copper, lead, mercury, and rock salt. Their sides are often covered with forests, and their valleys produce excellent grain.

The German or *Hercynian*[a] *Mountains* extend westward from the

[a] *Hercynian.*—This term is derived from the *Hercynia silva* of Tacitus an immense forest, which, in his time, extended over the greater part of the regions between the Danube and the Baltic.

Carpathians, near the source of the Oder, to the banks of the Rhine. They separate Germany into two great natural divisions—Upper and Lower Germany, or, as they are usually called, South and North Germany. The eastern part of their range, between Moravia and Austrian Silesia, is called the Sudetic[a] Mountains. This range, on reaching Bohemia, divides into two branches, which encircle it on all sides; the Riesen-gebirge[b] on the north-east, the Erz-gebirge[c] on the north-west, the Moravian Mountains on the south-east, and the Bohmer-Wald or *Bohemian Mountains* on the south-west. The average elevation of these mountains is between 2,000 and 3,000 feet. *Schnee-Koppe*, in the Riesen-gebirge range, in which the most elevated summits occur, is 5,274 feet above the level of the sea; and, as its name denotes, its *summit* is generally covered with *snow*. The Elbe rises on its southern side.

From the western extremity of Bohemia, near the junction of the Bohmer-Wald and Erz-gebirge Mountains, two more ranges branch off, one of which, proceeding in a north-west direction, extends to the kingdom of Hanover, where it is called the Harz Mountains; and the other, stretching in a south-westerly direction, passes over the high table-land of Bavaria, and through the western part of Wurtemberg to Baden, where it terminates in the Schwarz-Wald or *Black Forest* range on the banks of the Rhine, near the south-western extremity of Germany. The intermediate parts of both these ranges are called by various names. The average elevation of the Harz[c] Mountains is under 3,000 feet, and the highest of them is the Brocken,[d] which is 3,658 feet. The general altitude of the Schwarz-Wald range is rather less, but it contains the highest mountain in Western Germany, namely, Feldberg, which is 4,675 feet above the level of the sea.

The Mountains of France—not including the ranges of the Alps which separate it from Italy and Switzerland, nor the Pyrenees which form the boundary between it and Spain—are the chains of the Cevennes and the Vosges, the Mountains of Auvergne, and the Mountains of Forez.

The Cevennes are a long and narrow chain which commences in

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[a] *Sudetic.*—This term is sometimes applied to all the mountains between the sources of the Oder and the Elster, a tributary of the Elbe.

[b] *Riesen-gebirge.*—That is, the *Giant Mountains.*

[c] *Erz-gebirge.*—That is, the *metallic Mountains.* These mountains are richer in metal than any other range in Europe, and the *Harz* Mountains rank next in mineral wealth.

[d] *Brocken.*—This mountain is remarkable for the optical phenomenon which is called "the Spectre of the Brocken." It is a gigantic reproduction of the figure of the spectator, and of the surrounding objects, upon the white veil of mist which envelopes the mountain at early dawn. This mountain is within the Prussian territory.

Languedoc, north of the Pyrenees, and extending in a northerly direction, under different names, to the plateau or heights of Langres, forms the western boundary of the valley or basin of the Rhone, and also of its tributary the Saône. It also forms the eastern boundary or watershed of the streams which flow into the Bay of Biscay; as the Garonne and the Loire, and their numerous affluents.

The average elevation of the Cevennes Mountains is between 2,000 and 3,000 feet; and their highest summits are Mont Mezin and Mont Lozère. The former is 5,794 feet high, and the latter 4,884 feet.

The heights of Langres, which intervene between the head waters of the Marne and the Saône, connect the chain of the *Vosges Mountains* with that of the Cevennes. From this point the Vosges, extending in a northerly direction, and nearly parallel to the Rhine, form the boundary between the provinces of Alsace and Lorraine. On the opposite, or German side of the Rhine, and in a parallel direction, is the Schwarz-Wald or Black Forest range.

The average elevation of the Vosges Mountains is about the same as that of the Cevennes. The Ballon d'Alsace is their highest summit. It is 4,688 feet above the level of the sea.

The vine-covered slopes of the Vosges form a striking portion of the beautiful scenery of the Rhine; and the Schwarz-Wald, on the opposite side of the river, greatly adds to the beauty of it.

The Mountains of Auvergne are connected with the Cevennes on the west side. They extend in a north-westerly direction, and in detached groups, through the ancient province of Auvergne, and separate the basins of the Allier, Cher, and Creuse from those of the Lot and Dordogne. Their most elevated summits are Puy de Sancy (in the group of Côte d'Or), Plomb du Cantal, and Puy de Dôme, which are respectively 6,188, 6,093, and 4,806 feet high.

Several of the Auvergne Mountains are extinct volcanoes, and their general aspect is wild and rugged.

The Mountains of Forez are also connected with the Cevennes on the west side. They extend between the valleys of the Upper Loire and its tributary the Allier. Their average elevation is about 2,000 feet.

The wooded heights of Ardennes, or the *Forest of Ardennes*, with which Shakespeare has made us familiar, extend northward from the heights of Langres, between the valleys of the upper portions of the Moselle and the Meuse. Their greatest height is under 1,800 feet.

The Scandinavian or *Dovre-field Mountains* extend through the whole length of the Peninsula, from the Naze on the Skager-rack to Nordkyn on the Arctic Ocean, a distance little short of 1,100 miles. They do not, however, as is usually represented, form a continuous chain or ridge. On the contrary, they consist of—particularly in Norway—a series or succession of high table-lands, occasionally separated by deep and narrow valleys. On these table-lands or

plateaus, which the Norwegians call *fields*, there are numerous groups of mountains and high ridges in all directions. The chain of heights formed by these mountain-ranges divides the streams and rivers which flow into the Atlantic Ocean from those which flow into the Black Sea and the Gulf of Bothnia.

The four principal plateaus in Norway, beginning at the south, are Hardanger-field, Lang-field, Sogne-field, and Dovre-field. *Dovre-field*, which lies between the 62nd and the 63rd parallels, is the highest and most extensive of these plateaus, and hence its name is usually given to the whole range or mountain system. Its elevation above the sea is about 3,000 feet; and on it is the lofty *Snae-hatten*, and several other mountains, whose summits are covered with perpetual snow. Snae-hatten, which is 7,620 feet above the level of the sea, was formerly considered the highest mountain of the whole system; but it has been ascertained that there is a more elevated summit on the Lang-field plateau, namely Skagstol-tind, which is 8,670 feet high.

The main ridge of the Dovre-field Mountains extends through the middle of Norway, from the 59th to the 62nd parallel. From about this point it bends to the north-east towards Sweden, and from the 63rd parallel it forms the boundary between the two countries, under the name of the *Kiolen Mountains.*

The western or Atlantic side of the Scandinavian Mountains is much more precipitous and abrupt than the eastern side. High mountain ridges often extend to the very coast, and between them the sea penetrates far into the land, in narrow creeks, which the natives call *fiords*. These fiords are numerous along the whole coast of Norway, and many of them extend upwards of 50 miles inland. Many of them, too, have a most picturesque appearance. On each side are rugged rocks, or mountain heights, often covered with pine forests, which contrast beautifully with their deep and clear waters.

The Ural or *Oural Mountains* extend from the shores of the Arctic Ocean to the parallel of 51° 50′, near Orenburg—a distance of more than 1,200 miles. They form a part of the boundary between Europe and Asia; the river of the same name, the Caspian Sea, and the Caucasian Mountains forming the remainder. Their average elevation is between 2,000 and 3,000 feet; but some of their summits are much higher. Mount Yaman (in lat. 54°, long. 58°,) is 5,400 feet above the level of the sea; and Mount Iremel, not far to the north of it, is 5,070 feet. In some parts of their course, particularly about the 57th parallel, they become so low as not to deserve the name of mountains. It is over this depression, near the fortress of Ekaterinburg, that the great road from Russia to Siberia is carried.

The Ural Mountains are rich in gold, platina, and other metals, particularly between the parallels of 54° and 60° north latitude.

The mountains of Europe, which we have briefly described, might

be divided into *nine* distinct systems. Of these *three* are in the south of Europe, near the Mediterranean and its branches, namely, the Alps, the Pyrenees, and the Balkan Mountains; *three* are in central Europe, namely, the mountains of France, Germany, and Hungary; and *three* in the north-west, the north-east, and the south-east of Europe, namely, the Scandinavian, the Ural, and the Caucasian Mountains. The two last ranges are, however, half Asiatic.

THE PRINCIPAL MOUNTAINS OF AFRICA.

Less is known of the mountains of Africa than of those of any of the other great divisions of the globe; but fuller and more accurate information, not only on this subject, but also on other important matters connected with the hitherto *terra incognita* of this great continent, may soon be expected.[a]

MOUNT ATLAS and its subordinate ranges are the principal mountains in Africa. They extend in a direction nearly parallel to the Mediterranean, from the shores of the Atlantic to the Gulf of Sidra; but they do not form one continuous chain throughout their course. In many places they consist of parallel ranges and detached groups, particularly to the eastward of the 4th meridian of west longitude. In passing through Morocco they attain their highest altitude; and, strictly speaking, the name *Atlas* belongs only to this portion of the range. Miltsin, near the city of Morocco, is their highest known summit. Its elevation is 11,400 feet; but it is supposed that there are much higher summits in this portion of the range, and that their average elevation is between 7,000 and 8,000 feet.

Eastward of Morocco, as in Algiers, Tunis, and Tripoli, the elevation of these mountains scarcely ever exceeds 3,000 feet.

The Abyssinian Mountains rise in irregular groups and detached masses above the high table-land of the same name. In the province of Samien, in the north of Abyssinia, the highest summits occur, some of which are upwards of 15,000 feet above the level of the sea. Ras Detschen, which is supposed to be the most elevated summit, is 15,986 feet high. From the table-land of Abyssinia to the delta of the Nile, a series or succession of rocky hills and detached mountain groups extends along the western shores of the Red Sea.

The Kong[b] *Mountains* are in the west of Africa, north of the equator. They extend in an east and west direction, nearly parallel to the shores of the Gulf of Guinea, but upwards of 150 miles inland. The average elevation is supposed to be about 4,000 feet.

The Nieuvald Mountains extend east and west through the northern part of the Cape Colony. In the eastern portion of their course

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[a] From the explorations and discoveries of Dr. Livingston, &c.

[b] *Kong.*—This, it is said, is an African word for *mountains*.

they are called the *Sneeuberg* or *Snowy* Mountains. Compass Berg, in this part of the range, is 10,200 feet high.

Table Mountain, at the south-western extremity of the continent, and in the immediate neighbourhood of Cape Town, forms, with some adjoining heights, a detached mountain group. Its elevation above the level of the sea is 3,816 feet; and, as its name denotes, the summit is flat like a *table*.

The Cameroon Mountains, near the coast of the Bight of Biafra, are a detached group. Their highest summit, "the Peak of the Cameroons," is 13,739 feet above the level of the sea.

In the east of Africa, about four degrees south of the equator, and near the 35th meridian, there is a detached group of mountains, several of whose summits are supposed to be upwards of 20,000 feet high. One of these summits is called Kilmandjaro or the *Snowy Mountain*.

The Mountains of the Moon, as laid down in all maps of Africa previous to the discoveries of Dr. Livingston, are purely imaginative.

TABLE-LANDS OR PLATEAUS.

A *Table-land* or *Plateau* is a plain or tract of flat land elevated considerably above the level of the sea. Table-lands occur generally in the central parts of a country; and they are usually skirted or supported by mountain ranges.

Asia is particularly remarkable for the number and extent of its table-lands. In fact, almost the whole of the central part of this great continent, from the Altaï Mountains on the north, to the Himalaya Mountains on the south, consists of a succession of table-lands. Almost the whole of Tibet, the vast desert of Gobi, and the greater part of Mongolia are table-lands. The elevation of these table-lands varies from about 3,000 feet at the southern base of the Altaï Mountains, to upwards of 10,000 feet as they approach the northern slopes of the Himalayas, particularly in Tibet, in which there are plateaus upwards of 15,000 feet above the level of the sea. In Hindostan,[a] Afghanistan, Persia, Armenia, Arabia, and Asia Minor, there are also extensive table-lands, all of which are some thousands of feet above the level of the sea.

South America is also remarkable for the extent and elevation of its table-lands. The principal are: Titicaca,[b] Quito, Pasco, El Despoblado,[c] and Mexico, which have been already described;[b] and there are several others of considerable extent along the whole

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[a] As the Deccan, with the less extensive table-lands of Malwa and Mysore. The Deccan is from 3,000 to 4,000 feet above the level ot the sea.

[b] *Titicaca*.—See pp. 56 and 75.

[c] *El Despoblado*.—A desert region in La Plata and Bolivia. Its elevation above the sea is from 13,000 to 14,000 feet.

chain of the Andes in Central America, and among the mountains of Brazil and Venezuela. NORTH AMERICA, too, contains several extensive table-lands, but they are not remarkable for their elevation. Utah is the principal. See page 78.

In the interior of AFRICA there are also extensive table-lands, but their elevation is not remarkable. The Sahara or Great Desert is a table-land, but it is only about 1,200 feet above the level of the sea. The table-land of Abyssinia is perhaps the highest in Africa. It is upwards of 3,000 feet above the level of the sea.

EUROPE has also its table-lands, but they are not remarkable either for their extent or elevation. The principal are in the interior of Spain, in Bavaria, and in the south of Norway. See pp. 83 and 87.

Table-lands have the same effect upon temperature and vegetation as mountains; and hence in countries and places so circumstanced, the climate is much colder than their respective latitudes would lead us to expect. For example, Tibet may be said to be a comparatively cold country; and in Quito, which is in the heart of the torrid zone, the climate is found to be cool and agreeable. See pp. 56 and 72.

CHAPTER VII.

PLAINS AND DESERTS.

When the earth's surface appears to any considerable extent level, or even slightly undulating, it is called a PLAIN.

Plains, according to the nature of the climate and soil, are either fertile, or unfit for cultivation. In the British Islands, there are specimens of both kinds; of the latter in our bogs, morasses, and heaths. But it is only in continents that we are to expect plains hundreds of miles in extent. The north and north-east of the European continent consists of, with few interruptions, one immense plain. This vast tract, which extends from the shores of the German Ocean to the base of the Uralian Mountains, comprises the Netherlands,[a] Denmark, Northern Germany, and almost all European Russia. The only elevations of note by which the surface of this vast plain is broken, are the Valdai Hills in Russia, the highest of which do not exceed 1,200 feet. But, with few

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[a] *Netherlands.*—That is, *low*, or rather *lower* land; nether being the comparative of *neath*, as in be*neath*. The word HOLLAND has a similar signification, namely, *hollow*, or low land.

exceptions, such as the STEPPES[a] of Russia, the PUSZTA[b] of Hungary, and the marshy[c] and sterile tracts which are found in every country in Europe, particularly in those which border on the Baltic Sea and German Ocean, the European plains are fertile and cultivated. There is no plain in this continent of sufficient wildness and extent to deserve the name of DESERT. It is only in the other great divisions of the world that *deserts*, properly so called, are found.

The largest and most remarkable desert in the world, is the Sahara, or great African desert. It is, as its name imports, a vast *sea of sand*. Like the sea, too, its surface, when agitated by the winds, rises in waves, sometimes mountain-high; which, as they often move with great rapidity, have been known to overwhelm whole caravans of travellers. Sometimes the sands are raised by whirlwinds in the form of water-spouts, or moving pillars, whose tops reach almost to the clouds. Twenty or thirty of such pillars have been seen at once, moving in the same direction; and when they intervene between the spectator and the rising sun, their appearance is sublime and terrific beyond conception; for as his rays pass through them they resemble immense moving pillars of fire![d] In fact, it is more difficult and much more dangerous to cross the sea of sand than it is to cross

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[a] The principal in Europe are, the steppes of Ryn, between the Volga and the Ural river; and the steppes of the Volga, between that river and the Don. Siberia, or Asiatic Russia, also abounds in steppes, It is remarkable that some of the steppes have, from the beds of sand, marine shells, and pools of salt water which they contain, all the appearance of the bed of the sea.

[b] *Puszta.*—The puszta are properly extensive and barren tracts covered with deep *sand*, which indicate that they at some former period formed a portion of the bed of an inland sea. This term has, however, been extended to all the marshy and swampy tracts of country between the rivers Theiss and Danube, the extent of which has been estimated at 2,425 square miles. The estimated extent of the great plain of Hungary, in which the puszta occur, is 21,000 square miles, that is equal to about two-thirds of Ireland.

[c] As the *Pontine marshes*, the *Campagna di Roma*, and the Tuscan *Maremme* in Italy.

[d] As in the ocean nothing is seen in the horizon but an expanse of water, so in these immense deserts, nothing appears in view but a level expanse of sand: and as the sands are constantly shifting, there are no permanent land-marks to guide travellers in their course. They are, therefore, obliged to direct their course by the compass or the stars, as if they were at sea.

the Pacific Ocean, which extends over half the globe. Nor would it be possible to cross it, but for the *oases*, or fertile spots, which are met with here and there, like islands in the ocean.[a]

——— the tufted isles
That verdant rise amid the Lybian wild.

At those happy spots, the parched and exhausted travellers refresh themselves and their camels—*the ships of the desert*, as they have been beautifully called. And here, too, they lay in fresh supplies of water, which is carried for the use of the caravan in large leathern bottles. The want of water is the great danger to which caravans are exposed; for their entire stock is sometimes dried up under the parching influence of winds[b] peculiar to the desert. When this occurs, unless a fountain is at hand to afford them a fresh supply, both men and camels die from thirst.[c] It sometimes happens, too, that they find the fountain from which they expected a supply of water dried up under the same influences. In 1805, a caravan proceeding from Timbuctoo to Tafilet, not having found water at a resting-place, the whole persons belonging to it, 2,000 in number, with about 1,800 camels, perished miserably!

The deserts of Arabia, Syria, and Persia, are *Saharas* on smaller scales. We need not, therefore, stop to describe them. One distinguishing feature of the great desert in Persia is, that many parts of its surface are covered with saline incrustations, from which circumstance it is called the Great Salt Desert. The natives call it the *Deria Kuveer*, or salt sea; and the sandy wastes they call *sahra*. The Great Salt Desert is upwards of 700 miles in length.[d]

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a The ancients compared the oases to the spots upon the leopard's skin. Much of the beauty and fertility ascribed to them, is evidently due to the contrast between them and the burning deserts by which they are surrounded.

b Such as the Simoom. See page 127.

c In such extremities, the camels are killed for the sake of the little water that may remain in their stomachs.

d It commences on the north at the base of the Elburz mountain, in about the 36th degree north latitude, and uniting with the desert of Kerman, extends south to about the 30th degree; on the other hand, it extends from about the 51st to the 60th degree of longitude, occupying all the central and eastern parts of the country. It has a few oases, or fertile spots, but they do not amount to five per cent. of its extent.

In Hindostan there are extensive sandy deserts between the Indus and the branches of the Ganges; but they are not of so desolate a character as those which have been described.

In Central Asia, which consists of an immense PLATEAU or TABLE-LAND, is the great desert of Gobi; in the middle of which is the Shamo, or *sea of sand.* The length of the great desert of Gobi is about 1,200 miles, and the breadth from 500 to 700. Through the middle, for the whole of its length, extends the Shamo, or *sand sea*, varying in breadth from 150 to 250 miles. The great elevation of this desert, and its greater distance from the equator, preserve it from the scorching heats of the *saharas* of Africa and Arabia; but it is equally destitute of vegetation and water, and camels only can be used in crossing it.

In America there are immense plains and extensive deserts. The vast tract included between the Rocky and Alleghany Mountains on the one hand, and the Gulf of Mexico and the Great Lakes on the other, may be regarded as one immense plain. The southern portion of this vast plain is exceedingly fertile, but the western and north-western parts of it abound in deserts, SAVANNAHS, and PRAIRIES. In the western part of this plain, between the Ozark and Rocky Mountains, is the great American Desert. Its average breadth is about 400 miles, and it extends along the base of the Rocky Mountains as far as we have any acquaintance with that range. That portion of it which is traversed by the Platte river has, it is said, a strong resemblance to the barren steppes of Asia. The soil and rocks are saline, and incrustations of salt often appear on the surface, and the plants are such as are usually found in saline tracts. Trees and forests are almost unknown. This waste is scorched in summer by the rays of the sun, and chilled in winter by freezing winds from the mountains.

The SAVANNAHS and PRAIRIES are generally covered with a species of coarse grass, which often grows to the height of a man.[a] They are numerous in the states which border on the Ohio and Mississippi rivers, particularly between the latter river and the Rocky Mountains; and in the western part of the state of New York, several prairies of small extent

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[a] The savannahs and prairies, particularly about the Rocky Mountains, abound with herds of bisons, &c.

occur. And on the sea coast of the United States, particularly in New Jersey, Maryland, the Carolinas, and Georgia, there are extensive plains in which scarcely any things grows, except stunted *pines*. These sterile and dreary tracts are called PINE BARRENS. The other vast plains in America, are the basins of the Amazon, the La Plata, and the Orinoco. In these plains extensive savannahs occur. In the rainy season they are clothed with vegetation and verdure, but in times of drought they assume the appearance of deserts.[a] In the lower part of the basin of the Amazon, they are called *selvas* or *forest-plains;* in Venezuela, LLANOS; and in Buenos Ayres, PAMPAS. The llanos of Venezuela extend 200 leagues along the Orinoco river, from its mouth to the foot of the Andes; and the pampas of Buenos Ayres stretch out to an immense extent between the Paraguay river and the Andes. Immense herds of wild cattle range over those boundless plains.[b]

CHAPTER VIII.

RIVERS AND LAKES.

RIVERS, as was shown in the preceding chapter, have their origin in mountainous and elevated regions.[c]

The magnitude and character of rivers, generally speaking, depend upon the elevation of the mountains from which they derive their source, and the extent and nature[d] of the country drained by them and their tributaries. This will be evident, if we look at the BASINS, or extent of country drained by the American and other great rivers, as represented on globes and maps. The extent of country drained

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[a] There is something awful, but sad and gloomy, in the uniform aspect of these steppes (of Venezuela). Every thing seems motionless. The plains all around us seem to ascend towards the sky; and the vast and profound solitude appeared to our eyes like an ocean covered with verdure. The first aspect of the llanos excites scarcely less astonishment than the lofty peaks of the Andes.—HUMBOLDT.

[b] In 1548, Cristoval Rodriguez first let loose horned cattle on these extensive plains; and since that period, they have increased to a wonderful extent.

[c] Some rivers are at once formed by the overflowing of lakes.

[d] *Nature* of the country—that is according to the humidity of the soil and climate.

by the Amazon and its affluents, is nearly equal to two-thirds of the whole continent of Europe; and the basins of the Mississippi and La Plata are also of vast extent, though neither of them amounts to half the magnitude of the basin of the Amazon. It is almost unnecessary to observe, that the mountain-ranges from which the great rivers of America derive their sources, are the most extensive, and among the most elevated in the world. In the Old World also, it will be found that the great rivers have their origin in the principal mountain-ranges.

The velocity of rivers is, generally speaking, in proportion to the declivity of the ground over which they flow. When they meet with sudden declivities, RAPIDS are formed; when with abrupt or precipitous descents, CASCADES and CATARACTS.

The velocity of rivers is also accelerated by the quantity or volume of the water which they convey. Hence, the deeper a river is in proportion to its breadth, the quicker is its motion; for the greater will be the pressure of the particles of water from behind, upon those that precede. In fact, it is the pressure of the particles of water upon each other, not only from behind, but from above[a] also, that often carries rivers along level and extensive plains. Thus the Amazon, for the last 200 leagues of its course, has a descent of only 10½ feet, that is $\frac{1}{17}$th part of an inch for every 1,000 feet of that distance. And the Paraguay, for a considerable part of its course, descends only $\frac{1}{33}$rd of an inch in a mile.

Most of the large rivers discharge their waters into the sea by several mouths; as the Nile, the Ganges, the Volga, the Niger, the Orinoco, and the Rhine. Some have only one mouth, as the La Plata and the St. Lawrence. The mouth or estuary of the La Plata is 150 miles wide!

Some rivers are subject to periodical floods; as the Nile, the Ganges, the Indus, and the Mississippi. Those floods are produced by the heavy rains which fall during the wet season, particularly in the torrid zone, and by the annual melting of the snow on the mountains from which the rivers

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[a] The pressure of the particles from above, or, in other words, the force of gravity alone, will cause water to flow in a horizontal bed. Hence, the velocity of the water in a river or canal may be accelerated by increasing the depth without adding to the breadth.

derive their sources. The annual overflow of the Nile was considered a mystery by the ancients, because, in Egypt, no rain ever falls. But—"Nature well known, no prodigies remain,"—the periodical overflow of the Nile is no longer considered a mystery.

The floods of rivers, particularly in the torrid zone, are often most destructive to life and property. The great flood of the Ganges, in 1822, destroyed, it was estimated, from 50,000 to 100,000 persons, and swept away several entire villages. At the same time, these floods serve to irrigate and fertilize soils, which would otherwise be sterile and unproductive, by spreading over them deposits of vegetable mud and slime. It is thus that Egypt is rescued by its noble river from the sands of the Lybian desert;[a] and to the *gladdening* and happy effects produced by its floods, the ancient Euphrates is indebted for its name.[b]

CLASSIFICATION OF RIVERS.

The principal rivers in the world may be divided into TEN CLASSES, according to their lengths,[c] as in the following table:—

First Class.—Rivers between 4,000 and 3,000 miles long; as the Amazon, 3,900; the Mississippi with the Missouri, 4,000; the Yang-tse-kiang, 3,000; the Nile, 3,000.

Second Class.—Rivers between 3,000 and 2,000 miles long; as the Yenesseï, 2,900; the Hoang-ho, 2,600; the Obi, 2,500; the Lena, 2,400; the Niger or Quorra, 2,300; the Parana with the Paraguay, 2,300; the Amoor or Saghalien, 2,300; the Volga, 2,200; the Mackenzie, (including the Athabasca, &c.), 2,200; the St. Lawrence (from Lake Superior), 2,000; the May-kuang or Mekon (in Cambodia), 2,000; the Arkansas 2,000.

Third Class.—Rivers between 2,000 and 1,500 miles long; as the

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[a] "The Nile, which marks the extent of fertility by the measure of its inundations."—GIBBON.

[b] *Euphrates.*—From a Greek word, which signifies to *make glad.*

—————— Sparsus in agros,
Fertilis Euphrates, Phariæ vice fungitur unda.—LUCAN.

[c] The authorities are no more agreed about the lengths of rivers than they are about the heights of mountains. Nor is it to be expected that they should; for the sources of many of them are still unknown. Except for the *European* rivers, the lengths given are, for the most part, mere estimates. The learner should be required to trace these rivers on the maps of the countries through which they flow, from their *mouths* to their *sources*; noting their *tributaries*, the towns built upon them, &c.

Indus, the Euphrates, and the Danube, about 1,700 each; the Ganges, the Brahmapootra, the San Francisco, the Araguay with the Tocantins, and the Irrawadi, about 1,500 each.

Fourth Class.—Rivers between 1,500 and 1,200 miles long; as the Rio del Norte, 1,400; the Orinoco, the Dnieper, the Murray (in Australia), and the Amoo or Jihon, about 1,200 each.

Fifth Class.—Rivers between 1,200 and 1,000 miles long; as the Tigris, 1,140; the Don, 1,100; the Gareep or Orange River; the Sutlej, and the Syr or Sihon, about 1,000 each.

Sixth Class.—Rivers between 1,000 and 800 miles long; as the Magdalena, 860; the Colorado or Mendoza, 850; the Negro (between La Plata and Patagonia), the Uruguay, and the Godavery, about 800 each.

Seventh Class.—Rivers between 800 and 600 miles long; as the Rhine and the Northern Dwina, 760 each; the Oregon or Columbia, 750; the Dniester, 700; the Elbe, 690; the Gambia, 650; the Vistula, 630.

Eighth Class.—Rivers between 600 and 400 miles long; as the Loire, 570; the Oder, the Southern Dwina, and the Meuse, 550 each; the Tagus, 510; the Douro, 460; the Po, the Guadiana, and the Susquehanna, 450 each; the Seine, 430; the Ebro, 420; the Sacramento, 410; the Niemen, the Potomac, the Savannah, the Connecticut, 400 each.

Ninth Class.—Rivers between 400 and 300 miles long; as the Weser, 380; the Garonne and the Essequibo, 350 each; the Hudson, 325; the Delaware, 300.

Tenth Class.—Rivers under 300 miles long; as the Guadalquiver,[a] 290; the Shannon, 224; the Thames, 215; the Tiber, 215; the Tay, 120; the Forth, 115; the Clyde, 100.[b]

LAKES.

Lakes may be classed into four distinct kinds. The first class consists of those which neither receive nor give out streams of water. Lakes of this class are usually very small, and are supposed to be the *craters* of extinct volcanoes.

The second class consists of those which receive no running water, but which give out rivers or streams. Such lakes are formed and fed by springs and internal reservoirs.

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[a] *Guadalquiver.*—The ancient Boetis. The Arabs gave it this name, which means *the great river*; for so it must have appeared to them. In the arid plains of Arabia there are no rivers deserving the name; nor in Northern Africa, from which they passed over into Spain.

[b] Rivers not mentioned in the classification will be given in connexion with the countries through which they flow.

The THIRD, and largest class of lakes, consists of those which both receive and give out rivers or streams of water, as the great American lakes; the lakes of Ladoga, Onega, Constance, Baikal, &c. Several lakes of this kind may be considered as expansions of the rivers which flow through them. The great lakes of North America, for instance, may be considered as expansions of thê St. Lawrence; Geneva, of the Rhone; Constance, of the Rhine; Lake Dembea, of the Abyssinian Nile; Loughs Allen, Ree, and Derg, of the Shannon.

The FOURTH class consists of those which receive streams, and often large rivers, but which have no *visible* outlet; as the Caspian Sea, the Sea of Aral, the Dead Sea, the Great Salt Lake in North America, and Lake Tchad in Africa. The superfluous waters of such lakes are carried off, either by *evaporation* or by *subterranean* channels.

Lakes of the *fourth* class are usually salt, as the Caspian Sea, the Sea of Aral, Lake Van in Armenia, and Urumiyah, one of the largest lakes in Persia. In hot countries, and in the dry and desert regions of Asia, Africa, and America, salt lakes are often found, which, *evaporating* during the hot season, leave saline incrustations upon their beds, by which the natives are abundantly supplied with salt.

Some lakes contain *natron* or *soda*, which collects on the bottom. The most celebrated are the six Natron lakes of Egypt, which furnish large quantities for commerce. In Maracaybo (South America) there is a lake which deposits more than 1,000 lbs. in two years, which is taken up from the bottom by Indian divers. There are some lakes of this nature in Hungary.

Some lakes appear and disappear periodically; as Lake Zirknitz in Illyria, and Lake Xarayes to the eastward of the Paraguay river. The latter, from this circumstance, has been often drawn and effaced on the maps of South America. The appearance and disappearance of such lakes are produced by the increase or diminution of the sources from which they derive their waters.

We shall conclude this chapter by giving the *estimated* areas of the principal lakes in the world, in English miles.

ESTIMATED SIZE OF LAKES.[a]

Lakes.	Area in Square Miles.	Lakes.	Area in Square Miles.
Caspian Sea, .	130,000	Wetter, . .	850
Lake Superior,[b] .	32,000	Mæler, . .	760
Sea of Aral, . .	26,000	Lake Van, . .	560
Michigan, . .	24,000	Dead Sea, . .	340
Huron, . .	20,000	Palté, . . .	300
Baikal, . .	15,000	Balaton, . .	250
Tchad,[c] . .	12,000	Geneva, . .	240
Slave Lake, . .	11,000	Constance, . .	228
Gt. Bear Lake, .	10,000	Garda, . .	183
Winnipeg, . .	8,000	Lough Neagh, .	153
Erie, . . .	8,000	Lago Maggiore, .	152
Ladoga, . .	6,330	Neufchatel, .	115
Ontario, . .	5,500	Lucerne, . .	99
Nicaragua,[d] . .	4,800	Zurich, . .	76
Titicaca,[e] . .	3,800	Como, . . .	66
Onega, . .	3,280	Lomond, . .	40
Wener, . .	2,135	Ness, . . .	15
Dembea, . .	1,130	Windermere, .	7½

CHAPTER IX.

TIDES AND CURRENTS.

Tides, or the alternate flowing and ebbing of the sea, are produced by the attraction of the moon and sun, but principally by the attraction of the moon. For the moon being so much nearer to the earth than the sun, has a much greater attractive influence on its waters than the sun.

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[a] In most cases, the *estimated* areas of these lakes are to be considered as mere approximations to the truth. Even with regard to *European* lakes, the authorities in some cases differ.

[b] *Lake Superior* is the largest body of fresh water in the world. It is equal in extent to the whole of Ireland.

[c] Several extensive lakes have been recently discovered in Southern Africa; as Ngami, Nyassi or Maravi, Taganyika, and Nyanza.

[d] *Nicaragua*, lies principally between the 11th and 12th degrees of north latitude, and the 84th and 86th of west longitude; about 12 miles in a direct line from the Pacific, and 90 miles from the Caribbean Sea, with which it is connected by the River St. Juan. The junction of the Atlantic and Pacific oceans, by means of this lake and river, has often been proposed.

[e] *Titicaca*, the largest of the South American lakes. See p. 75.

The ancients looked upon the flowing and ebbing of the tides as one of the greatest mysteries in nature; and but for the more than human intellect of Newton, it is probable that it would have remained a mystery to this day.[a]

The phenomenon of the tides has been observed in every part of the earth which is washed by the sea. For about six hours the sea gradually swells, so that it enters the mouths of harbours and rivers, and comes nearer to the coasts. This is called FLOOD TIDE. For about twelve minutes it rests or remains in *equilibrio;* during which it is said to be HIGH WATER. It then begins to ebb, and continues to do so for about six hours, when it pauses again for about twelve minutes; during which it is said to be LOW WATER. It then begins to flow again for six hours; and so on, alternately. Hence, in every twenty-four hours and fifty minutes there are two tides.[b]

The continual flowing and ebbing of the sea, combined with the WAVES[c] which agitate it, and the CURRENTS which run through it, keep its waters in constant motion, and thus prevent them from becoming stagnant and corrupt. But the SALTNESS of the sea, which is found to increase in warm climates where it is most required,[d] contributes chiefly to preserve its waters from putrefaction.[e]

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[a] Galileo, Descartes, and particularly Kepler, made some successful approaches towards ascertaining the cause. That the tides had some connexion with the moon was natural to suppose, for they were observed always to follow her motion. The moon comes every day later to the meridian than on the preceding day, by about 50 minutes; and the tides in every part of the world happen exactly so much later every day as the moon comes later to the meridian.

[b] If the moon were stationary, the same part of our globe would return under it every 24 hours, and there would, in consequence, be two tides every 24 hours; but while the earth is turning once upon its axis, the moon moves forward in her orbit 13°, and hence it takes the earth about 50 minutes more to bring the same meridian under or opposite to the moon.

[c] The highest waves known are those which occur off Cape Horn, and those produced by a north-west gale off the Cape of Good Hope, some of which are nearly 40 feet high from the trough to the crest.

[d] The greater the heat, the greater the evaporation, and hence, in warm regions, the waters of the sea must be salter than they are in cold regions where the evaporation is less; for, while the water ascends in vapour, the salt which it contained is left behind.

[e] If the waters of the sea became stagnant and corrupt, the earth would be rendered uninhabitable; for the atmosphere, instead of being purified, as it now is, by the perpetual agitations of the ocean, would

The tides, as we have stated, are produced principally by the attraction of the moon. As the earth turns round on its axis it presents every part of its surface, in succession, to the moon, which, from the nature of attraction, exerts a greater attractive influence upon those parts of the earth's surface that are turned towards her, or *nearest*, than upon those that are turned from her, or most remote. Hence, as seas pass under the moon—or, as is said, when the moon comes to the meridian of the place—the fluid particles of which they are composed, being more easily separated and attracted than particles of earth, are drawn more strongly towards her, which causes them to swell and flow, till the impulse is overcome by the attraction of the other watery particles, as they are brought by the rotation of the earth, under the more direct influence of the moon.[a]

While the water is thus attracted and heaped up on the side of the earth which is nearest to the moon, it is at the same time equally elevated on the other side of the earth or the side which is farthest from the moon; and hence there are always two tides at the same time, one on the side of the earth next to the moon, and the other on the opposite side.

That the moon should attract and raise up the waters of the earth that are under her, is easy to conceive; but that the same cause should, at the same time, raise them up on the opposite side of the earth, seems strange and incredible. It is, however, perfectly true, and is easily demonstrated. The general principle is, that as those parts of the earth which are nearest to the moon are more strongly attracted

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be polluted by the exhalations arising from it, and thus unfitted for animal and vegetable life.

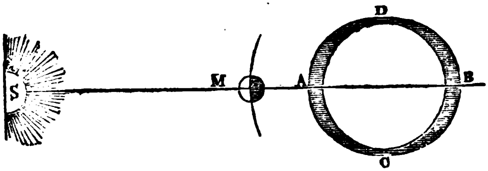
See Coleridge's "Ancient Mariner" for a touching and most poetical picture of the effects produced by a long calm near the equator—particularly the verse beginning with,

"*The very deep did rot.*"

[a] The tide is not at its highest when directly under the moon, but in two or three hours after; and often, according to the obstructions it meets with from projecting coasts, and in narrow channels, it is not high water till after the moon has passed the meridian several hours. But even where there are no interruptions, as in great oceans, it is not high water till the moon has passed the meridian two hours or so; for the waters continue to *accumulate* till the moon, by an overcoming impulse, draws them away. Compare the facts stated in note, p. 83.

towards her than the parts which are most remote, the *sea* which covers the surface of the earth on the side farthest from the moon is less strongly attracted than the *land* which is under it, and which is consequently nearer to the moon. Hence, the body of the earth being more strongly attracted than the waters which cover its side farthest from the moon, is *drawn away* from these waters, and the same result is produced as if they had risen in tides.

The following diagram will give a clearer conception of the causes of the tides than any thing we can say on the subject. To simplify the matter, let us suppose the earth to be a regular and uniform sphere covered with water; and if there is no attraction or influence from any external body, the water will, in obedience to the laws of gravitation, arrange itself regularly and uniformly around the earth, forming a coating like the rind of an orange, and every where of the same depth. Now, let us suppose that the earth is brought under the attractive influence of an external body, like the moon, and the effects which we have already described will be produced.



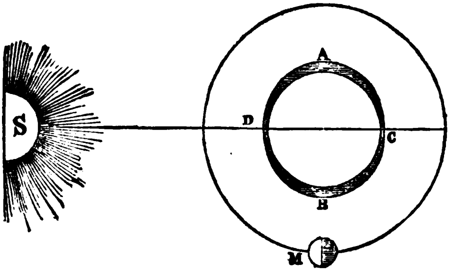
In the above diagram, A B D C is the earth, M the moon, and S the sun. At A and B the waters on the side of the earth nearest and farthest from the moon, are heaped up or elevated, and it is high water in both places. But at D and C it is low water; because the elevation of the waters at A and B causes a corresponding depression of the waters at the intermediate parts of the earth, D and C.

At the new and full moon the attraction of the sun is added to that of the moon, and the tides are in consequence *raised higher*; but when the moon is in her quarters, the attractions of the sun and moon counteract each other, that is, they act in different directions, the attraction of the one raising the waters, while that of the other has the effect of

depressing them, and *lower* tides than usual are produced. The former are called SPRING, and the latter NEAP tides.

In the preceding diagram we have *spring* tides, because the sun and the moon combine to raise the waters on the side of the earth next them, and consequently the waters on the opposite side also. And at full moon the same result will be produced, though the sun and moon are attracting different and opposite sides of the earth; for, as we have seen before, when the waters are raised or depressed on one side of the earth, they are equally raised or depressed on the opposite side.

In the following diagram, *neap* tides are represented. M is the moon in one of her quarters; and it is evident that her power to raise the waters of the earth at B is counteracted, and lessened by the attraction of the sun at D, which prevents the waters from falling so low there, and consequently from rising so high at B. At the first and third quarters of the moon, therefore, the tides are neither so high at *high* water, nor so low at *low* water as usual; while at new and full moon they are higher and lower than usual.



The influence of the moon, like that of the sun, is greater near the equator, and the tides are consequently higher in that direction, and lower towards the poles, near which they are scarcely perceptible.

In oceans and large open seas, the tides rise at regular periods, and not higher than one or two feet; as in the

islands of the Pacific Ocean. But when they are interrupted in their course by coasts and headlands, or by passing through straits and channels where they often meet with opposing currents, the time at which they occur[a] is retarded, and the height to which they attain increased in proportion.

In inland seas and lakes, as in the Baltic and Mediterranean, the surface is so small,[b] comparatively speaking, that it is all equally attracted at the same time, and there is scarcely any tide perceptible. But in bays, harbours, and seas open in the direction of the great tidal wave[c] from oceans, as in Baffin's and Hudson's Bays and the Red Sea, there are regular, and often very high tides. In the British Channel the tide sometimes rises forty or fifty feet; and in the Bay of Fundy it rises sixty, and often so rapidly that cattle feeding on the shore have been drowned before they could escape. At the mouths of large rivers opening in the direction of the tidal wave, as the Indus and Ganges, tides often rise to the height of thirty, and even forty feet, and sometimes with destructive rapidity.

CURRENTS.

The CURRENTS of the sea, which run through it in different directions, and with different degrees of rapidity, contribute to keep its waters in constant circulation. Some appear to be permanent and regular, like the great equatorial and polar currents; while others, like the causes that produce them, are subject to change and irregularity.[d]

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[a] *Winds* also often produce great irregularities in the *time* and *height* of tides.

[b] The contributing, and indeed chief causes of the almost imperceptible tides in the Mediterranean and the Baltic, are the narrowness of their entrances, and their not being turned in the direction of the great tidal wave.

[c] The great TIDAL WAVE is supposed to originate in the Southern Ocean, the most open of all; and to be imparted from it to the Pacific, the Atlantic, and the Indian Oceans, through which it travels north. The great Atlantic tidal wave flows to the coasts of Europe and America. It first reaches the western coasts of Ireland and England, producing HIGH WATER as it goes along. On the eastern coasts of the British Islands high water is later than on the western, for the tidal wave has farther to travel. To the eastern coasts of Great Britain for instance, the tidal wave has to travel round the north of Scotland, or round the south of England.

[d] Such as a gale of wind; a change in the temperature, or in the

The great EQUATORIAL CURRENT of the Atlantic Ocean, which flows constantly from east to west, for about thirty degrees on each side of the equator, is the most regular and the most extensive current in the ocean. In the Atlantic Ocean, within the tropics, it begins to be felt near the coast of Africa. On reaching Cape St. Roque, the eastern projection of South America, it is divided into two branches or streams, one of which flows along the coast of Brazil; the other and principal branch proceeds to the north-west, and turning into the Caribbean Sea, passes into the Gulf of Mexico through the straits formed by the western extremity of Cuba and the peninsula of Yucatan. Here, after following the bending of the coast from Vera Cruz to the mouth of the Rio del Norte, and thence to the mouths of the Mississippi, and along the western coast of Florida, it rushes with great rapidity through the Gulf or Strait of Florida, under the name of the GULF STREAM, so well known and so useful to mariners. The re-action produced by striking against the coasts of the Gulf of Mexico, the immense quantity of water added to it by the great rivers which discharge themselves into that gulf, and the narrowness of the channel by which it escapes, all conjoin to increase the velocity of the Gulf Stream. After passing through the Bahama Channel, it turns to the north-east, and flows along the coast of the United States[a] with diminishing velocity, till it strikes against the southern shores of Newfoundland. Here it changes its course to the east-south-east, about[b] as

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saltness, between two parts of the sea, &c. Lieutenant Maury, of the United States Navy, in his valuable and interesting work on the *Physical Geography of the Sea*, gives it as his opinion, that the difference between the salter and therefore heavier waters of the tropics, and the fresher and therefore lighter waters of the poles, is one grand cause of the ocean currents.

[a] The velocity of the Gulf Stream, in issuing from the gulf, is about five miles an hour; and along the coasts of Georgia and the Carolinas, from three to two miles an hour. Its distance from the shore here is about 70 miles, but recedes gradually from it as it proceeds northward. Its general breadth is about 60 miles, but it also increases as it moves northward. As it proceeds to a colder climate, it is easily distinguished by the beautiful blue colour of its waters, its higher temperature, and the exhalations and fogs which arise from it, particularly near Newfoundland. Even on its arrival on the shores of Newfoundland, it retains a temperature of about 8° above that of the waters on each side of it.

[b] To the west of the Azores there is a large expanse of the Atlantic

far as the Azores,[a] where it divides into two branches, one of which turns to the north-east, and flows towards the coasts of the British Islands and Norway; and the other and principal branch bends to the south-east, and flows in the direction of the Canary Islands and Africa, till on reaching the parallel of Cape Blanco, it completes its grand tour of the Atlantic, by mingling its waters with the great western or equatorial current, from which it originally proceeded, and with which it again sets out in the direction of America.[b]

The other branch which turns to the southward off Cape St. Roque, and flows along the coast of Brazil, changes its course to the eastward, at the north of the estuary of the Rio de la Plata, and *re-crosses* the Atlantic to the Cape of Good Hope, under the name of the *South Connecting*

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covered with floating sea-weed (*fucus natans*), which the Spaniards called the *Sea of Sargasso.* It lies between the Gulf Stream and the Equatorial Current. The Sea of Sargasso has undergone little change in any respect since it was first observed by Columbus in 1492. He was alarmed by its appearance, and mariners avoid it still because it impedes the progress of their ships. There is another, but a much smaller "sea-meadow," or field of floating sea-weed, between the Bermudas and the Bahama Islands.

A portion of the Sea of Sargasso consists of accumulations brought by the Gulf Stream from the Gulf of Mexico, but the peculiar weed of which the mass principally consists grows on the spot. Humboldt, in speaking of it in his "Cosmos," says—"These evergreen masses of *fucus natans* (one of the most widely distributed of the social sea plants), driven gently to and fro by mild and warm breezes, are the habitations of a countless number of small marine animals."

[a] About the end of the fifteenth century, before the discovery of America, two bodies belonging to an unknown race of men were cast by the Gulf Stream on the coast of the Azores. This circumstance, it is said, strengthened Columbus in his belief regarding the existence of a western continent. The productions of tropical America have often been cast upon the coasts of Norway and Scotland; and in one instance the mast of a vessel burned in the West Indies was cast upon the Hebrides.

[b] It is related by Humboldt, that "casks filled with palm oil, the remains of a cargo of an English ship wrecked off Cape Lopez in Africa, were carried to Scotland, after having twice crossed the Atlantic Ocean; once from east to west, between 2° and 12° north latitude, following the course of the equatorial current, and once from west to east, between 45° and 55° north latitude, by help of the Gulf Stream."

In the South Atlantic Ocean, there is a similar *circuit* of currents, by means of which a perpetual movement and constant interchange of the waters is kept up, the effects of which are most beneficial. And in the other great oceans there are similar currents.

Current.[a] Sailing vessels from Europe to the Cape of Good Hope often find it their shortest course, in point of *time*, to cross and re-cross the Atlantic in the direction of these currents.

In the Pacific Ocean, the EQUATORIAL CURRENT moves with great regularity from the western coast of America to the eastern coasts of Asia and Australia; and it is of great advantage to mariners navigating their ships in that direction. On arriving there, a portion of it bends to the southward, and following the coast, moves round the southern extremity of Australia, where it produces the strong currents that are met with in the Straits between it and Van Diemen's Land. But the main portion of it makes its way through the Indian Archipelago to the Indian Ocean, where, in conjunction with the equatorial current there, it continues its course to the westward. In passing through the Archipelago it is interrupted and divided into several distinct currents by the numerous islands that lie in its way, which render navigation difficult and dangerous in this island-covered sea.

On reaching the eastern coast of Africa it bends to the southward, and following the line of coast, it flows round the Cape of Good Hope to the northern shores of the Gulf of Guinea, where turning to the west, it joins, and perhaps gives the first impulse to the great equatorial current in the Atlantic Ocean.

The Mozambique Current is the name given to that portion of this current which flows between the Island of Madagascar and the mainland. In issuing from the mouth of the Channel it is particularly strong, and to this circumstance Cape *Corrientes* owes its name.

The Agulhas Current[b] is a continuation of the Mozambique Current, and of other portions of the equatorial current from the Indian to the Atlantic Ocean. It is a very powerful current, and it is of great advantage to our mariners in their homeward voyage round the Cape from Asia or Australia.

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[a] This current may be said to be connected with the Agulhas or Guinea Current, and also with the current which sets from the Cape of Good Hope towards Australia.

[b] This current derives its name from Cape *Agulhas*, the extreme southern *point* of Africa. The term properly means a *needle*.

But the whole of the current we have been describing does not pass round the Cape into the Atlantic Ocean. A portion of it is stopped in its progress by a submarine bank near Cape Agulhas, and deflected back in an easterly direction. Of this current our mariners take advantage in their outward voyage to Australia.

The great POLAR CURRENTS flow from each of the poles in the direction of the equator. It is owing to these currents that immense masses[a] of floating ice are carried annually from the polar to the temperate regions, which render navigation so dangerous in the northern parts of the Atlantic Ocean, particularly in foggy weather.[b] And it was by the prevalence of these currents that Captain Parry's celebrated attempt to reach the north pole by means of boat-sledges and rein-deer was frustrated. He found that as they advanced over the fields of ice to the *northward*, they were actually carried at a quicker rate to the *southward*.[c]

If from the middle of a tub filled with water you take up the full of a quart, for instance, you will observe the water rushing from the sides of the tub towards the centre, till an equilibrium or level is produced. This is a familiar illustration of the causes which produce the currents of water from the poles towards the equator. The great quantity of water raised by evaporation in the equatorial regions produces a deficiency, and destroys the level of the waters in the middle part of the globe; and hence, from the colder regions, north and south, currents flow towards the equator, to supply the deficiency and to restore the equilibrium.

This appears at variance with the description which we have given of the *western* tendency of the waters within the tropics; but the following explanation will reconcile the discrepancy. The waters, as they advance from the polar seas towards the equator, come from regions where the

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[a] Sea-water ice occurs in fields; fresh-water ice, in huge irregular masses, formed during the flow of water over the face of lofty and precipitous cliffs.

[b] Icebergs from the polar seas have been met with near the Azores in the northern hemisphere, and near the Cape of Good Hope in the southern.

[c] It is owing to these currents that pine trees in great numbers are frequently cast upon the northern coast of Iceland which supply the inhabitants with much of their fuel. These pines are brought by polar currents from Siberia and North America.

rotatory motion of the earth is less,[a] to those where it is greater; and before they have time to acquire the rapid velocity with which the earth moves in the equatorial regions, they are left rather behind, that is, to the *westward;* the earth turning round in the opposite direction. Hence, as the water does not move eastward along with the earth, it will *apparently* move *westward;* and this apparent motion will be kept up by the continual arrival of water, to which the increased velocity of the equatorial regions has not been communicated.

Contrary currents flowing side by side are often met; and of the existence of *under* currents there can be no doubt—that is, of currents flowing in one direction on the surface, while at a greater depth below them, currents flow in different and even in opposite directions. Thus, in the Cattegat, one current enters the Baltic along the coasts of Jutland, while another glides out of it by the shores of Sweden; and it is concluded that the Mediterranean, into which a powerful current constantly flows through the Straits of Gibraltar, sends back, by *under* currents, a portion of its water to the Atlantic.[b] A similar interchange of waters takes place between the Red Sea and the Indian Ocean. A constant current flows into it through the Strait of Bab-el-Mandeb, for which a compensating quantity of water is sent back by an *under current.*

When two opposing currents of equal force meet, particularly in narrow channels, they sometimes, by turning upon a centre, assume the form of *eddies* or *whirlpools.* It is thus the celebrated Charybdis, the terror of ancient mariners, is formed; and the modern, and far more dangerous Charybdis, the Maelstrom on the coast of Norway. The power of the latter is such, that ships and even whales have been drawn in and ingulfed from a distance of two or three miles. It roars, especially in storms, with a tremendous

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[a] See note, page 43.

[b] In some parts of the Caribbean Sea, where the equatorial currents run strongly, it has been affirmed that a boat might be kept in a fixed position by suspending from it a heavy body at a depth sufficient to place it beyond the influence of a current on the surface. In this case it is assumed, that the immersed body would be impelled by an *under* and contrary current, in a direction opposite to that of the boat, and with equal force.

noise, and its influence is often felt at the distance of seven or eight miles.[a]

The Antarctic Current, which seems to be the *primum mobile* of all the great currents we have been describing, originates in the wide expanse of the Antarctic Ocean. The general flow of its waters is in a north-east direction, towards the western coasts of South America. On reaching the shores of Patagonia, it bends to the north, and flows along the coast till it comes opposite to about the middle of Peru, where it turns to the west, and gives the first impulse to the great equatorial current of the Pacific Ocean. This current in its northward course is called the *Peruvian Current*. The Arctic waters of which it consists impart a cooling and refreshing effect to the temperature along the whole coast of Chili, and a portion of that of Peru.

There are many other important currents which cannot be noticed in a work of this kind. In charts and works for the use of mariners they are indicated and described, in order that they may avoid those that are adverse, and take advantage of those that are favourable to them.

The currents of the ocean,[b] by circulating from cold to warm regions, not only tend to equalize the temperature of its waters, but have a similar effect upon the temperature of the earth. Extreme cold would render many parts of the earth uninhabitable, but for the milder temperature of the adjoining seas.

CHAPTER X.

THE ATMOSPHERE—ITS PROPERTIES, AND USES.

THE ATMOSPHERE[c] is that transparent, elastic, and invisible fluid which encompasses the earth on all sides to the height

[a] The dangers of the *Maelstrom* have been greatly exaggerated. It is only when its current is opposed by a strong wind from the N.W. that it deserves this description.

[b] Within the temperate zones, as far at least as the parallel of 45° or 50° on both sides of the equator, the general direction of the currents is *from west to east*. In higher latitudes, particularly in the polar seas, the general set of the currents is to the *southward* within the northern hemisphere; and to the *northward* within the southern hemisphere.

[c] *Atmosphere.*—That is, the *vapour* of the *sphere*. The air was formerly considered to be an elementary or simple substance; but it is now

of about forty-five miles.[a] It revolves with the earth round its axis, and is carried with it in its orbit or course round the sun. The existence of this fluid is essential not only to animal, but also to vegetable life. Where it is very *rare*, as on the tops of lofty mountains, respiration or breathing is found to be very difficult; and it is known that if an animal be placed within the exhausted receiver of an air-pump, it will immediately die.

Without an atmosphere there would be neither rain nor dews to refresh and fertilize the earth. It decomposes and dissipates the mephitic or infectious vapours which are continually exhaling from the earth; and it is the grand agent which, by tempering the extremes of heat and cold, renders every clime habitable to man. It is to its REFLECTING and REFRACTING powers that we owe the morning and the evening TWILIGHT, and the general diffusion of the sun's light over the whole heavens. If it were divested of these powers, instead of the gradual approach of night which prepares the world for the change, the transition from the brightness of day to the darkness of midnight would be instantaneous. And it is entirely owing to the REFLECTIVE powers of the atmosphere that the sun is enabled to light up the heavens. For if his rays were not reflected and diffused through the heavens, only that part of the sky in which he appears would be enlightened, while in every other direction the sky would be as dark as midnight, and the stars would be visible at noonday.

REFLECTION—TWILIGHT.

In the morning, when the sun is eighteen degrees below the horizon, his rays pass over our heads into the higher regions of the atmos-

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ascertained to be compounded of two distinct and very different ingredients, namely, *oxygen* and *nitrogen* gas. In every 100 parts of atmospheric air the constituent parts are, according to Dr. Murray:

	By Measure.	By Weight.
Nitrogen gas or impure air, .	77·5	75·55
Oxygen gas or pure air, . .	21·0	23·32
Aqueous vapour, . . .	1·42	1·03
Carbonic acid gas, . . .	·08	·10

[a] The *exact* height of the atmosphere cannot be determined, but above this distance from the earth, it ceases from its great rarity to reflect the rays of light from the sun.

phere, from which they are *reflected* towards the earth. The day is then said to *dawn;* and the light continues to increase till the sun appears above the horizon. In the evening, in like manner, we have light from the sun till after he has sunk eighteen degrees below the horizon. This light, which grows fainter and fainter till it is lost in the darkness of night, is called TWILIGHT. The duration of twilight varies with the latitude of the place, the season of the year, and the height and state of the atmosphere. In the equatorial parts of the earth the twilight is at all seasons very short,[a] while in the polar regions it lasts often for several months. For as the sun during the winter, in those regions, is scarcely ever more than eighteen degrees below the horizon, the twilight, during that season, scarcely ever terminates. The inhabitants of those dreary regions, therefore, though deprived for a great part of the year of the presence of the sun, are not, as we might conclude, left in total darkness. The lengthened twilight,[b] the almost constant light of the moon,[c] and the brilliancy of the *Aurora Borealis*, particularly about the winter solstice, enable them often to pursue the ordinary occupations of the day.

"Even in the depth of polar night, they find
A wondrous day; enough to light the chase,
Or guide their daring steps to Finland fairs."

REFRACTION.

The density of the atmosphere increases in proportion to its proximity to the earth; for the nearer any portion of the atmosphere is to the earth, the more it is compressed by the parts which lie above it; just as if a quantity of wool were piled up upon a floor, those flakes which are lower would be more pressed, and therefore heavier or denser than the flakes or layers which are above them. Hence, when the rays of light enter the atmosphere, they are *refracted* or bent towards the earth, or the eye of the observer, in a curved line. From this cause all the heavenly bodies, except when in the zenith, appear higher than they really are; and in consequence of this we are

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[a] In the equatorial parts of the earth, the sun descends beneath the horizon in the evening, and approaches it in the morning, in a *direct*, and therefore, *speedier* course; while in the other parts of the earth, particularly in the direction of the poles, he moves *slantingly* from and towards the horizon (in the evening and morning).

[b] *Twilight.*—That is, the *light between* day and night.

[c] As the moon, when at full, is in the opposite side of the heavens to the sun, she must be constantly above the horizon when the sun is below it. Hence in winter, the full moon is as high in the heavens, and as long above the horizon as the sun is in summer. And hence also at the polar circles the full moon is constantly above the horizon while passing through the northern signs.

enabled to see the sun for a short time[a] before he rises above, and also for a short time after he sets below the horizon. At the horizon, where refraction is always greatest,[b] it amounts to something more than half a degree (33′); from which it follows[c] that when we see the lower edge of the sun or moon apparently resting upon the horizon, its whole disc is in reality below it; and would, of course, be invisible to us but for the refraction or bending of the rays of light in their passage through the atmosphere to our eye.[d]

This may be illustrated by the following well-known and simple experiment. Put any small object, as a shilling or half-crown into an empty basin, as near the centre as possible, and then walk backwards till you just lose sight of the object. Let another person then pour water into the basin, and the object will again appear; and if you walk farther back till you lose sight of it again, let more water be added, and the object will again become visible. Now, if the *edge* of the basin be supposed to represent the *horizon;* the *water*, the *atmosphere;* and the *shilling*, the *moon;* it is evident that it will be seen *above* the horizon when *really* below it.

Refraction may also be familiarly illustrated by dipping the end of a staff or the blade of an oar into water. If the staff or oar is held in a slanting position, it will appear bent, and as if broken, from the part where it enters the water; but if it be held in a perpendicular position, it will appear straight as before, because there is no refraction in the direction of the zenith.

WEIGHT OF THE ATMOSPHERE.

Compared with the more solid parts of the earth the atmosphere is exceedingly light;[e] but as a whole it presses upon the earth's surface with an amazing weight. The mercury in a barometer is supported by the weight of the atmosphere, and by this instrument it

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[a] At some periods of the year, the sun appears five minutes sooner in the morning and later in the evening than he would do if there were no refraction.

[b] Because the atmosphere is most compressed, and consequently densest there.

[c] If two straight lines were drawn, one from the upper and the other from the lower edge of the sun or moon to the eye of an observer, they would contain an angle of about half a degree. In the middle of winter when the sun is nearest to us, his apparent diameter subtends an angle of 32½ minutes; and at midsummer, when he is farthest from us, it is about a minute less, that is, 31½′.

[d] On the 20th of April, 1837, the moon appeared to rise eclipsed before the sun had set, which, but for the effects of refraction, could not possibly have occurred; for the three bodies would not have been *in a line* with each other. The same phenomenon occurred on the 20th of September, 1717.

[e] *Water* bulk for bulk has about 840 times the weight of air.

appears that a column of the atmosphere of any given diameter, from its highest boundary down to the level of the sea, is equal in weight to a column of mercury of the same diameter of the height of thirty inches. It also appears (and upon this principle the common pump is constructed) that a column of the atmosphere is equal in weight to a column of water having the same base, thirty-two feet high. Hence it follows that the whole atmosphere would be equal in weight to a stratum of mercury covering the earth to the depth of thirty inches; or to an ocean of water surrounding it to the depth of thirty-two feet; or to a globe of lead sixty miles in diameter. It has also been calculated that the pressure of the atmosphere upon every square inch of the earth's surface is equal to a weight of about fifteen pounds;[a] and consequently the pressure which it exerts upon an ordinary-sized man, the surface of whose body amounts to about fifteen square feet, will be 32,505 pounds, or, in other words, upwards of fourteen tons! This pressure, which we do not even feel, would crush and destroy us were it not equal in every part, and counterbalanced by the spring or elasticity of the air within us.

CHAPTER XI.

EVAPORATION—CLOUDS—RAIN—DEW—SNOW—HAIL.

THAT process by which water is raised in *vapours* by the agency of the sun and air from seas, lakes, rivers, and moist places of the earth, is called EVAPORATION. These vapours being specifically lighter than the air which is near the earth's surface, ascend in it till they reach a stratum of their own weight, where they remain stationary. As long as they are blended and united with the air, or, as is said, are held in solution by it, they continue invisible, just as salt when dissolved in water is invisible. But when the air becomes saturated by the accession of fresh vapours, or when its dissolving power is diminished by a decrease of temperature, they are condensed, and the watery particles of which they are composed become visible, either in the form of *clouds* or *mists* floating through, or suspended in the atmosphere,—or in that of rain, hail, or snow, falling to the ground.

Though there appears to be an endless variety in the figures of the clouds, yet they are found to assume regular and systematic forms,

[a] It has been shown by the barometer that a column of the atmosphere whose base is a square inch, weighs, when the air is heaviest, fifteen pounds.

which has led to their classification into CIRRUS, CUMULUS, and STRATUS, with their combinations, CIRRO-CUMULUS, CIRRO-STRATUS, &c. The CIRRUS clouds are those of the least density, and consequently of the greatest elevation. The term in Latin signifies curled or frizzled hair; also *fringed* or *fibrous*. The CUMULUS are those convex and conical masses which are formed in the lower regions of the atmosphere. The term in Latin means *piled* or *heaped up*. The STRATUS is a widely extended sheet of clouds often reaching to the earth. It is properly the cloud of the night. The term in Latin signifies *spread* or *extended*. To these may be added the NIMBUS or *rain cloud*.

Clouds extending to, or in contact with the earth, are called MISTS or FOGS. They are produced by a certain degree of chilness in the lower stratum of the atmosphere;[a] and in the warmer regions of the earth, they either vanish before the sun, or rise higher into the air as clouds. In cold climates, particularly in the polar regions, they are very frequent; and in some places, as off the coasts of Newfoundland, they are almost continual. This renders navigation very dangerous in those seas, particularly during the season of the ICEBERGS.

To the vapours which fall from the atmosphere in the form of rain, hail, and snow, the earth is indebted for its springs, brooks, and rivers, which, flowing into the sea, restore to it the waters formerly drawn from it by evaporation. Hence we see that a constant circulation of waters is carried on, for the benefit of mankind, between the earth and the sky. The water that is raised by evaporation from the sea is purified in the air, and distributed over the earth by the clouds for the purpose of vegetation; and it is still further prepared for the use of men and animals, by being impregnated with the mineral particles which it meets with in filtering through the earth before it makes its appearance again in the form of SPRINGS. Rain-water, though the purest kind of water, is from that very circumstance too insipid for drinking.

[a] That is, when the lower stratum of the atmosphere is cooler than the land or the water over which it rests. The temperature of the surface of the sea in those parts of the world is greater than that of the air which is over it, because when the upper stratum of water is cooled, it descends, being heavier, and its place is supplied by warmer water from below. But the high temperature of the waters brought by the Gulf Stream is the chief cause of the fogs in this part of the Atlantic. See page 106.

RAIN—DEW—SNOW—HAIL.

In the warm regions of the earth evaporation is most abundant; and so, as we should expect, is the quantity of rain. In the torrid zone the annual average quantity of rain has been computed to be about ninety-six inches, while in the north temperate zone it is little more than thirty inches, that is, less than one-third. By inches of rain is meant the depth which rain falling upon a square inch of surface would acquire supposing none of it to be absorbed by the ground.[a] Hence we are enabled to form an idea of the amazing quantity of rain which falls upon the earth, and of the equally amazing amount of the evaporation which supplies it. Nor can we fail to be struck by the fact, so illustrative of the Divine agency, that the greatest quantity of rain descends upon those parts of the earth which most require it.

In the following places the average annual quantity of rain has been observed as annexed:

Places.	Latitude.	Inches.	Places.	Latitude.	Inches.
Grenada (W. I.)	12° 8′	126	Paris, . .	48° 49′	21
Jamaica, . .	18° 0′	83	Plymouth, .	50° 23′	37
Calcutta, . .	22° 39′	81	London, . .	51° 30′	24
Charlestown,	32° 46′	54	Upsal, . .	59° 52′	16
Rome, . .	41° 53′	39	St. Petersburgh,	60° 0′	16

But though the quantity of rain in the warm regions of the earth[b] is so much greater than in the cold and temperate parts of it, the number of *rainy* days is less; just as in our latitude, the mean quantity of rain which falls in summer is much greater than in winter, though the number of wet days is usually much less.

The following table shows the number of wet days in the year, within certain parallels of latitude, compared with the annual quantity of rain, as nearly as can be ascertained:—

North Latitude.	Rainy Days.	Quantity of Rain.
From 12° to 43°	78	75 inches
„ 43° „ 46°	103	40 „
„ 46° „ 50°	134	35 „
„ 50° „ 60°	161	25 „

[a] The instrument for measuring the depth of rain is called a *pluviometer* or *rain-gauge*.

[b] In the torrid zone, the rain-drops are often more than half an inch

In the torrid zone, the temperature ranges within comparatively small limits; and the phenomena of the atmosphere occur from year to year with a regular and uniform succession unknown in this part of the world. The winds are either permanent or periodical; and the rains regularly descend at a certain season of the year, and never at any other. In fact, the only divisions of the year in those regions are the *dry* and *rainy* seasons.[a] In the northern half of the torrid zone it is the rainy season, when the sun is north of the equator; and the dry season, when the sun is south of the equator. And in the southern half of the torrid zone, the seasons, in like manner, depend upon the place of the sun. Wherever the sun is vertical or overhead, the rains and clouds are almost constant,[b] because the atmosphere is not able to contain all the vapours which are raised by the increased heat; and thus we see that a provision has been made for protecting the earth from the perpendicular rays of the sun.

The effects of these periodical rains and droughts in the tropical regions of South America[c] are thus described by Humboldt:

"The immense plains (called LLANOS)[d] which in the rainy season display a beautiful verdure gradually assume the aspect of a desert; the grass is reduced to powder, the earth cracks, and the alligators and the large serpents remain buried in the dried mud till the first showers of the year awaken them from their lethargy.

"The rainy season begins about the end of April. The sky becomes obscured, the azure disappears, and a grey tint is spread uniformly over it; at the same time the heat progressively increases, and soon dense vapours cover the heavens from one end to the other. The plaintive cry of the howling monkeys begins to be heard before the rising of the sun. The atmosphere is at length convulsed by frequent thunder storms, the rains descend in torrents, and the rivers rising rapidly above their banks overspread the plains with extensive inundations."

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in diameter; while in these regions they seldom exceed a few lines. In fact, the rain falls in such torrents there that 16 inches have been collected in a rain-gauge in the space of 24 hours (at Bombay).

[a] It is only in the temperate zones that the four seasons are known. From the sixtieth degree of latitude to the poles only two seasons take place, a long and severe winter, and a short, warm, but ineffectual summer; and within the tropics, it may be said to be perpetual summer.

[b] The rain does not fall during the night, nor till about the middle of the day, and it ceases in four or five hours.

[c] In the northern tropical regions of Africa showers commence in April, and increase till June, when torrents of rain begin to descend, and continue almost three months without intermission. The face of nature is soon changed; rivulets, before dried up, swell into large rivers; rivers overflow their banks; and the plains become vast lakes. In the course of September the rains cease, and not a drop falls till the following April.

[d] *Llanos* is another name for *pampas* or *selvas*. See page 95.

The suffering which the wild horses of the llanos endure on these occasions are thus described by the same author:

"In the rainy season the horses that wander in the savannah, and have not time to reach the rising grounds of the llanos, perish by hundreds amidst the overflowings of the rivers. The mares are seen followed by their foals swimming during a part of the day to feed upon the grass, the tops of which alone wave above the waters. In this state they are pursued by the crocodiles; and it is by no means uncommon to find the prints of the teeth of these carnivorous reptiles on their thighs."[a]

In the West Indies, and in some other parts of the torrid zone there are *two* rainy seasons; but one of them is of much shorter duration, and has much lighter rains than the other.[b] And in some parts of the same zone, from the effect of mountain-ranges and peculiar winds, places under the same parallel (as the countries divided by the Ghauts in the south of Hindostan) have their dry and rainy seasons at opposite periods of the year.[c] In some parts of the torrid zone, too, as the Sahara of Africa, the desert of Gobi, and the plains of Peru, rain seldom or never falls.[d] In Egypt too, as we have observed before, rain is almost unknown.

Generally speaking, in all parts of the world mountains and elevated regions are more subject to rain than plains and level countries in the same latitude; and the same may be said of places near the sea, as islands and coasts, when compared with places remote from the sea (as the interior of a country) though under the same parallel. The reason is obvious; the mountains, as we observed before, intercept the clouds and bring them down in rain; and thus they are

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[a] The horse is not originally a native of these regions. They were first introduced by the Spaniards.

[b] The *second* rainy season occurs when the sun passes the zenith of the place on his return from the tropic, but there are many irregularities in this respect occasioned by local circumstances.

[c] The south-west monsoon parts with most of the vapours with which it is charged as it blows over the lofty range of the Western Ghauts, and there is consequently only a small supply of moisture left for the high table-lands in the interior; and by the time it reaches the eastern or Coromandel coast it has become a dry or rainless wind. During the continuance of this monsoon it is the rainy season on the Malabar coast, and in the regions of the Western Ghauts. The reverse of this is the case on the Coromandel coast, and in the regions of the Eastern Ghauts, during the continuance of the north-east monsoon.

[d] The south-east trade-winds retain almost all the vapours with which they are charged while passing over the comparatively low mountains of Brazil, but on approaching the Andes they part with the whole of them in those heavy rains which feed the streams of the Amazon and its numerous affluents. These same winds, on the other side of the Andes, as in Peru, have little or no moisture to communicate, and the region is consequently almost rainless.

often almost all brought down before they are carried over countries very remote from the sea; so that the nearer a place is to the sea, from which the vapours arise, the more frequently is its atmosphere saturated with them; and of course, the more likely it is to receive a large portion of them in rain.[a]

DEW.

That moisture which in warm and dry weather, after sunset, is insensibly precipitated from the atmosphere upon the surface of the earth, is called DEW. In the warm regions of the earth, particularly in tracts of country destitute of rain, the dews are exceedingly heavy; and it need scarcely be observed that they are of the greatest use in refreshing the earth and promoting vegetation.

It was formerly thought that dews were produced by the cooling of the atmosphere after the disappearance of the sun, which, of course, would diminish its solvent power, and cause all the vapours which it could not hold in solution to descend in moisture to the earth. But it has recently been proved that they are caused by the previous cooling of the surface of the earth, which radiates or parts with its heat much more rapidly than the surrounding air. After sunset, therefore, the surface of the ground having become cooler than the atmosphere which is in contact with it, condenses and draws from it the vapours which it held in solution during the heat of the day. When a glass of cold water is brought into a warm room, particularly in summer, the outside of the glass will soon become covered with moisture, though it was perfectly dry when brought into the apartment. Now this familiar fact exemplifies the formation of dew. The outside or surface of the glass is colder, in consequence of the water which it contains, than the atmosphere of the room, and hence it condenses and forms into dew the vapoury particles with which it comes in contact. The outside of a bottle of wine brought fresh from a cold cellar into a warm dining-room will exemplify the same fact; and it is upon the same principle that moisture is formed upon the inner side of the glass in the windows of a close carriage, or of a heated room.[b]

It has been observed that in cloudy nights there is little or no dew. This is because the earth's surface on such occasions has much the same temperature as the surrounding air; for the heat that it radiates or gives out is reflected back to it again by the clouds; whereas, in clear and cloudless nights, the radiation of heat from the earth

[a] At Bergen the annual fall of rain is 89 inches, while on the other side of the mountains, at Christiana, the fall is but 20 inches.

[b] The glass, in consequence of its exposure to the external air, is colder than the atmosphere within, and hence it condenses and forms into dew the vapoury particles which come in contact with it.

passes without obstacle to the higher regions of the atmosphere, and its surface is in consequence rapidly cooled.

It has also been observed, and the fact is worthy of our admiration, that in the same locality the deposition of dew is, generally speaking, in proportion to the necessity there is for it. It has been found, for instance, that a thermometer laid upon grass marked 16½° lower than one laid upon a gravel walk beside it; and hence we may infer that the grass in a dewy night would receive a large portion of it, while little or none would be deposited on the gravel walk. And generally, we may infer that little or no dew falls upon rocks, roads, sands, or water, even while grass and vegetables in the same locality are covered with it.

When the dew which falls upon the earth is frozen by the cold, it is called HOAR-FROST. But MILDEW is not of atmospheric origin.

SNOW AND HAIL.

The other forms which the vapours of the atmosphere assume are SNOW and HAIL. When the aqueous particles or rain-drops at the moment of formation are crystallized, or frozen by the cold, they assume the form of snow; and if, while falling through the atmosphere, they are still further united and congealed, they assume the form of hail; for hail may be regarded as a species of snow or snowy-rain. Judging from appearances, we might conclude that the cold humidity of snow must be very detrimental to vegetation, but the contrary of this is the case. Snow, particularly in those regions where the ground is covered with it during the winter months, is of great service to vegetation, by protecting corn and other vegetables from the intenser cold of the air, and especially from the cold piercing winds. It also serves to moisten gradually those lands from which, owing to their situation, the rain is soon carried off. Except in mountainous and elevated districts, snow is unknown in the warm regions of the earth; but hail has been known to fall in all parts of the earth, and at all seasons of the year, even in summer. The formation of hail seems to be owing to electrical agency; one proof of which is, that thunder and lightning are often attended with hail showers; and in fact, artificial hail can be produced by means of an electrical apparatus.

CHAPTER XII.

WINDS.

THE primary cause of wind is the heat of the sun, which rarefies and expands that portion of the atmosphere which, by the motion of the earth, is more immediately exposed to his rays. The air when rarefied becomes lighter, and consequently

ascends to the higher regions, while the surrounding air, which is less rarefied and heavier, rushes in to supply its place. This current or motion of the air is called WIND, and according to its velocity it is said to be a BREEZE, GALE, STORM, &c.

Hence it is that there are always draughts or currents of air towards a fire, or into a warm room, if the window be raised.

Winds are generally divided into three classes—*permanent*, *periodical*, and *variable*. The permanent winds extend nearly 30 degrees on each side of the equator, and blow almost always in the same direction. They are also called TRADE winds, from the great advantages which *trading* vessels derive from their steadiness and permanency.[a] By the aid of these winds, vessels which sail from Acapulco to the Philippine Isles, often finish a voyage nearly equal to half the circumference of the globe in 60 days, without altering their course or changing a sail.

The *higher* temperature, and the *greater* rotatory motion in the *equatorial* regions of the earth, are the causes of these great currents of air, as well as of the great currents of water which we have described in a preceding chapter as constantly flowing in a westerly direction for about 30 degrees on each side of the equator. To supply the place of the air which is constantly ascending from the torrid zone, in consequence of its rarefaction by the more direct rays of the sun, continual currents from the temperate and colder regions move in the direction of the equator. And as in the case of the currents of water from the frigid and temperate zones, these currents of air coming from regions where the rotatory motion of the earth's surface is slower, to those where it is quicker, are, before they can acquire this new velocity, left behind; and they will thus, as they do not move *eastward* along with the earth, have the appearance of moving the contrary way, that is, to the *westward*. But it is only as they approach the equator that the trade-winds take a westerly direction, or in other words, blow from the eastward.[a] Their first impulse being in the direction of the equator, they were

[a] To get into the trade-winds in sailing from east to west, is a rule in navigation. Hence the usual course for sailing vessels from the British Islands—except in winter, when the limits of the northern trade-winds is too far south—is to steer southwards, by Madeira, till the trade-winds are met with.

originally north and south winds; but as they approach the torrid zone, they begin to deflect to the westward. At the northern tropic they blow from the north-east, and at the southern, from the south-east, varying a point or two of the compass either way; and as they approach the equator, they gradually blow from the eastward.

If the great equatorial band of the earth were covered with *water*, the trade winds would blow constantly and regularly in the direction here stated. But the unequal and varying temperature produced by the interposition of large tracts of land, snow-clad mountains, and heated plains of sand, diverts them from their course, and subjects them often to sudden and great irregularities. Hence it is that the trade-winds are more constant and regular in the Pacific than in the Atlantic; and in the Atlantic,[a] than in the Indian Ocean. In fact, there is no *northern* trade-wind in the Indian Ocean. It has been converted, as we shall see, into a *periodical* wind, which blows one-half of the year in one direction, and the other half in the opposite. The southern trade-wind, however, blows constantly between Australia and Madagascar.

The irregularities produced in the trade-winds by the causes we have assigned, give rise to the *periodical* winds which change with the changing seasons. The most important of this class of winds are the MONSOONS,[b] which blow half of the year in one direction, and the other half, from the opposite points of the compass; and when they shift, they are accompanied by terrific thunder storms, torrents of rain,

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[a] Into the Gulf of Guinea, and along the whole coast from Sierra Leone to the equator, southerly and south-westerly winds continually blow. The great heat and consequent rarefaction of the air over the burning deserts of Africa are evidently the causes. On the coast of Peru there is constantly a breeze from the south-west. Lieutenant Maury has since shown that the northern trade-wind of the Atlantic, for a considerable distance from the coast of Africa, is, in point of fact, *a monsoon*. From June to the end of November it blows from the *south-west*, and brings with it the rains which periodically fall upon the coasts of Senegambia and Guinea. But when the sun returns to the southern side of the equator, it resumes its direction as a trade-wind, and blows from the *north-east* for the remaining six months of the year. In the same way, upon the American side of the Pacific, the regular *north-east* trade wind is, for a considerable distance from the coast, as in Peru, converted into a monsoon, as in the analogous cases in the Atlantic and Indian Oceans.

[b] *Monsoon.*—From an Arabic word, signifying *season*.

and furious hurricanes, which render it hazardous to put to sea. These winds prevail most in the Indian Ocean, and do not extend more than 200 leagues from land.

The monsoons, as well as the trade-winds, depend on the sun: for when the sun is north of the equator—that is, from the vernal to the autumnal equinox, they blow from the south-west; and during the remaining six months of the year, while the sun is south of the equator, they blow from the north-east. When the sun is north of the equator, Arabia, Persia, Hindostan, and the Eastern Peninsula are more heated than the Indian Ocean, and the colder air from the sea consequently rushes *northward* to supply the place of the air which, in consequence of its great rarefaction, constantly ascends from these countries at this season of the year. And as this air coming from the equator has a different and opposite motion impressed upon it, the consequence is, that the compound motion of south-west will be produced. But from October to April, when the sun is south of the equator, the air above the sea being much warmer than the air above the land north of it, a north-east wind blows from these countries in the direction of the Indian Ocean. The following graphic description of the south-west monsoon is from Elphinstone's "Kingdom of Caboul":—

"The most remarkable rainy season in India is that called the SOUTH-WEST MONSOON. It extends from Africa to the Malay peninsula, and deluges all the intermediate countries within certain lines of latitude for four months in the year. In the south of India this monsoon commences about the beginning of June, but gets later as we advance towards the north. Its approach is announced by vast masses of clouds that rise from the Indian Ocean, and advance towards the north-east, gathering and thickening as they approach the land. After some threatening days, the sky assumes a troubled appearance in the evenings, and the monsoon in general sets in during the night. It is attended by such a thunder-storm as can scarcely be imagined by those who have only seen that phenomenon in a temperate climate. It generally begins with violent blasts of wind, which are succeeded by floods of rain. For some hours lightning is seen almost without intermission; sometimes it only illuminates the sky, and shows the clouds near the horizon; at others it discovers the distant hills, and again leaves all in darkness, when in an instant it reappears in vivid and successive flashes, and exhibits the nearest objects in all the brightness of day. During all this time the distant thunder never ceases to roll, and is only silenced by some nearer peal, which bursts on the ear with such a sudden and tremendous crash as

can scarcely fail to strike the most insensible heart with awe. At length the thunder ceases, and nothing is heard but the continual pouring of the rain, and the rushing of the streams. The next day presents a gloomy spectacle: the rain still descends in torrents, and scarcely allows a view of the blackened fields: the rivers are swollen and discoloured, and sweep down along with them the hedges, the huts, and the remains of cultivation which was carried on, during the dry season, in their beds.

"This lasts for some days, after which the sky clears, and discovers the face of nature changed as if by enchantment. Before the storm the fields were parched up, and, except in the beds of the rivers, scarce a blade of vegetation was to be seen: the clearness of the sky was not interrupted by a single cloud, but the atmosphere was loaded with dust, which was sufficient to render distant objects dim, as in a mist, and to make the sun appear dull and discoloured till he attained a considerable elevation; a parching wind blew like a blast from a furnace, and heated wood, iron, and every other solid material, even in the shade; and immediately before the monsoon, this wind had been succeeded by still more sultry calms. But when the first violence of the storm is over, the whole earth is covered with a sudden but luxuriant verdure; the rivers are full and tranquil; the air is pure and delicious; and the sky is varied and embellished with clouds. The effect of the change is visible in all the animal creation, and can only be imagined in Europe by supposing the depth of a dreary winter to start at once into all the freshness and brilliancy of spring. From this time the rain falls at intervals for about a month, when it comes on again with great violence, and in July the rains are at their height; during the third month they rather diminish, but are still heavy; and in September they gradually abate, and are often entirely suspended, till near the end of the month, when they depart amid thunder and tempests, as they came.

"Such is the monsoon in the greater part of India. It is not, however, without some diversity, the principal feature of which is the delay in its commencement, and the diminution in the quantity of rain as it recedes from the sea."

The LAND and SEA BREEZES, which are common in tropical and warm climates, are produced by the same causes, namely, the unequal and varying temperature of the land. In fact, they are *monsoons* on a small scale. During the day the surface of the earth becomes more heated than that of the adjoining sea; and the air above it, partaking of its higher temperature, ascends, while the air from the sea, being cooler and heavier, rushes in to supply its place. During the night the reverse of this takes place; for the air above the land suddenly cooling, while that above the sea preserves a more

equable temperature, the currents of air or breezes blow from the land towards the sea.[a]

The winds which are produced by the more direct influence of the sun, as in the tropical regions, are, as we have seen, either *permanent* or *periodical;* but in the other regions of the earth the winds are *variable*, because they depend on a variety of causes, such as the expansion and contraction of the volume of the atmosphere by the ascent of vapour in clouds, or their descent in rain; for wherever the equilibrium in the atmosphere is destroyed, currents of air or wind will rush in that direction till it is restored. But as this equilibrium is supposed to be disturbed chiefly by electrical changes in the atmosphere, electricity may be considered as the principal cause of the variableness of the winds.[b]

HURRICANES, TORNADOES, CYCLONES, and TYPHOONS are sudden and furious tempests which occur in tropical regions. They may be regarded as vast *whirlwinds* rotating round a central axis, *about which it is calm*, and at the same time moving onward at the rate of from ten to twenty miles an hour. In their progress, they increase in diameter and diminish in intensity; and their diameters vary from 50 to upwards of 500 miles. In the northern hemisphere they rotate from *right to left*, and in the southern from *left to right*. The term *typhoon*[c] is applied to the hurricanes which sweep over the Chinese seas about once in three years.

There are several other winds of a local and peculiar character, such as the Sirocco, the Harmattan, the Simoom, and the Samiel. These winds are rendered pestilential by the suffocating sands of the deserts, or by the putrid exhalations of the swamps and marshes over which they pass.

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[a] In the West Indies, the land breeze usually begins at about seven o'clock in the evening, and blows till eight in the morning, when the sea breeze begins, increasing till about one o'clock, and gradually dying away in the afternoon. Between the changes there is a period of stillness, as between the ebbing and flowing of the tides. These alternate breezes are felt very powerfully on the coast of Malabar; their effect extending to the distance of twenty leagues from the land.

Without the sea breeze the heat of many places in these climates would be insupportable.

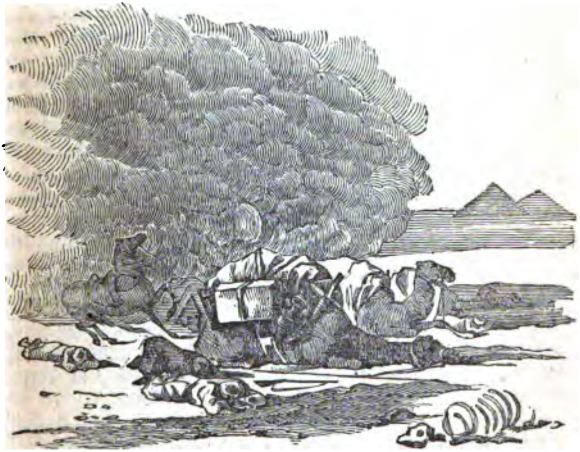
[b] In the temperate zones, in both hemispheres, the prevalent winds are *westerly*. This coincides with the general direction of the currents in these regions. See note [b], p. 111.

[c] *Typhoon* is from the Greek *τυφων*, *a whirlwind*.

The SIROCCO occurs in the south of Europe, particularly in the south of Spain and Italy, It blows from Africa, and during its continuance, which varies from a few hours to two or three days, all nature appears to languish; vegetation withers; the beasts of the field droop; and in the human frame it produces great uneasiness and exhaustion, irritating the nerves, and checking perspiration.

The HARMATTAN blows periodically from the Sahara towards the Atlantic Ocean, producing such a dryness and heat, that vegetation withers under it, and sometimes even the skin of the negroes cracks and peels off under its influence. This wind, however, is conducive to general health by checking the progress of some diseases, and effectually curing others.

The SIMOOM and SAMIEL are peculiar to the burning deserts of Africa and Arabia; and of all others are the most dreadful and desolating in their effects. The Samiel, which



occurs in the deserts of Bagdad, not only produces instantaneous death, but so mortifies the limbs of the body that they easily come asunder. Camels seem to have an instinctive knowledge of its approach, which they indicate by making

an unusual noise; and to avoid breathing it they thrust their noses into the sand; and it is in a similar way that travellers endeavour to escape its effects, namely, by throwing themselves down with their faces close to the ground, till it passes over, which is usually in a few minutes.

THE ETESIAN WINDS are *periodical* winds which blow from the north and north-east for about six weeks throughout the Mediterranean, particularly the Levant. They commence about the middle of July, and blow only during the day, beginning about nine in the morning. These winds bring rain and fertility to the countries on the northern coast of Africa.

Near the north side of the equator, and between the respective trade-winds, there is a narrow belt, which is called the ZONE OF CALMS, because it is particularly subject to long-continued calms. It is, however, occasionally visited by sudden and violent storms, particularly when the sun is vertical, or nearly so; and during this season, torrents of rain fall almost every day. The following description has been given of it:—"The sun rises at six o'clock in a clear sky, and soon after mid-day, almost without exception, clouds appear, and a storm of rain and thunder follows. The sky then clears, and the sun sets at six o'clock without a cloud." Generally speaking, the zone of calms extends from the immediate neighbourhood of the equator to 5° or 6° north of it; but the breadth varies periodically. It is widest in September, and narrowest in January. Sailors dread the calms of this region more than they do the most violent storms.[a]

The velocity of the wind varies from one to one hundred miles an hour. At the former its motion is almost imperceptible; at the latter it throws down houses, tears up trees by the roots, and sweeps their branches through the air. But in these countries the greatest velocity of the wind is supposed never to exceed sixty miles an hour. At ten miles an hour the wind is called a *breeze;* at twenty, a *gale;* at fifty, a *storm;* and a *hurricane* at eighty miles an hour.

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[a] See Coleridge's "Ancient Mariner" already referred to (p. 102):

> "Day after day, day after day,
> Without a breath or motion;
> As idle as a painted ship
> Upon a painted ocean."

CHAPTER XIII.

DISTRIBUTION OF VEGETABLES.

Vegetables are adapted to every kind of climate, soil, and locality; and hence they are found in every part of the earth, from the equator to the polar regions.

Some vegetables delight in great heat, others in moderate, while others flourish best in cold. Some are confined to mountains, others to valleys, while others luxuriate in open plains. Some, again, require a moist soil and humid atmosphere, while others grow only in dry regions and arid tracts; and even on the surface of naked rocks,[a] a species of vegetation exists. In this way, nearly the whole earth is covered with vegetation, and plants are found even in the dark recesses of caverns and mines, and in the beds of rivers, lakes, and seas. In short, heat and cold, sun and shade, dry and moist, fertile lands and pathless deserts, every locality and every temperature, has its own peculiar vegetation; and in those regions where vegetables cease to grow, *lichens* and *mosses*, capable of supporting animals, and even human beings, are found amid perpetual snows.

But it is in the torrid zone that vegetables are found in the greatest vigour, variety, and beauty. There, under the rays of a tropical sun, the herbaceous plants of the temperate and frigid zones, become shrubs—and shrubs, trees; while the size and number of the trees of those regions are beyond our conception.[b]

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[a] It is in such situations the *cow-tree* is found; so called, from supplying the inhabitants of those parched regions with a rich vegetable milk. The following is Humboldt's description of it:—"On the barren flank of a rock grows a tree with coriaceous and dry leaves. Its large woody roots can scarcely penetrate into the stone. For several months in the year not a single shower moistens its foliage. Its branches appear dead and dried; but when the trunk is pierced, there flows from it a sweet and nourishing milk. It is at the rising of the sun that this vegetable fountain is most abundant. The blacks and natives are then seen hastening from all quarters, furnished with large bowls to receive the milk, which grows yellow and thickens at its surface."

[b] The following description of the vegetation on the banks of the Cassiquiare, a river which connects the Amazon with the Orinoco, is from Humboldt:—"The luxuriousness of the vegetation increases in a manner of which it is difficult, even for those who are accustomed to

The trees of the majestic forests there are generally above a hundred feet in height; and many, particularly some species of the palm-tree, reach to 150, and even 200 feet. The gigantic baobab, on the banks of the Senegal, and in the islands of Cape Verd, is found with a trunk 50, 60, and even 70 feet in circumference, and many of its branches are larger than our largest trees. One of the leaves of the great fan-palm, will cover eight or ten men, and two or three of them are sufficient to cover a cottage.

The torrid zone is distinguished by the delicacy, as well as by the luxuriance of its vegetable productions. The most delicate spices, as cinnamon, nutmeg, cloves, and pepper, are confined to it; and in it are found the most delicious fruits, the most odoriferous herbs, and the most brilliant and beautiful flowers.

According to Humboldt, the species of plants known when he wrote,[a] amounted to 44,000, of which 6,000 belonged to the class *cryptogamia*.[b] They are thus distributed:—

In Europe, ...	7,000
Temperate regions of Asia, ...	1,500
Asia, within the tropics, and islands, .	4,500
In Africa, ...	3,000
Both the temperate regions of America, .	4,000
In America, between the tropics, . .	13,000
New Holland, and the islands of the Pacific,	5,000

He also states the proportions of plants which grow in latitudes 0°, 45°, 68°, to be as the numbers 12, 4, and 1; which shows how prolific vegetation is in the equatorial parts of the earth, compared with the temperate and colder regions.

The utility of VEGETABLES to mankind is obvious. Some

the aspects of the forests between the tropics, to form an idea. There is no longer a beach: a palisade of tufted trees forms the bank of the river. You see a canal upwards of 400 yards broad, bordered by two enormous walls, clothed with lianas and foliage. We often tried to land, but without being able to step out of the boat. Toward sunset we sailed along the bank for an hour, to discover, not an opening (since none exists), but a spot less wooded, where our Indians, by means of the hatchet and manual labour, could give space enough for a resting-place for twelve or thirteen persons."

[a] Several have been discovered since, and more remain behind; for, except in Europe, the earth has been but partially explored.

[b] *Cryptogamia*, such as have neither blossoms nor visible fructifications, as the mosses, ferns, &c.

supply us with *food*, as the different kinds of grain, fruits,[a] and roots; others furnish us with *clothing*, as cotton, flax, and hemp. Some are valuable to us as *medicines;* and others supply us with *timber*, without which there could be neither commerce nor civilization.

Some valuable plants appear to be confined to their native soil, as the *clove* and *nutmeg* to the Spice Islands; the genuine *cinnamon* to Ceylon; and the best *tea* to China. But the seeds of the most useful plants have been carried over the earth in various ways, and propagated in soils and climates suitable to their nature.

Thus the seeds of plants and stones of fruits are carried by winds, currents, and birds, to different and often distant localities; and commercial intercourse brought the *sugar-cane* and *coffee-tree*, natives of Asia, to the West Indies. The *potato* and *Indian-corn* are natives of America.

CHAPTER XIV.

DISTRIBUTION OF ANIMALS.

THE earth, the air, the waters, and, in short, all nature appears to be full of *animated* beings. We cannot, however, take more than a hasty glance over this vast kingdom of nature.

Like vegetables, ANIMALS are adapted to different climates, soils, and localities; and hence they are found in every part of the globe inhabited by man. The most useful animals, too, like the most important vegetables, are the most widely distributed. The ox, the horse, and the hog, are found from the equator to the polar circles; while the sheep, the goat, and the dog, extend over the whole habitable globe. Horses and oxen, indeed, degenerate and disappear as they approach the frigid zone, but their places are supplied by the existence of animals peculiarly adapted to those dreary regions. The uses of the *reindeer* to the Laplanders are well known, and animals of the same species abound in the Arctic regions of Asia and America. The dog, too, the affectionate and faithful follower of man in every country and in every clime, becomes doubly serviceable to him in those desolate regions

[a] The *bread-fruit* tree, the *plantain* and *banana* (which are varieties of the same species), the *sago*, and several other kinds of *palm* trees, supply the inhabitants of the torrid zone with much of their food.

where the assistance of other animals is denied him. Where the horse and reindeer disappear, a hardy and sagacious species of dog, peculiar to the polar regions, supplies their place. It is on sledges drawn by dogs, that the Esquimaux and Kamtschatdales travel over their snowy plains.

The correspondence between the covering of animals and the climate which they inhabit, is strikingly exemplified in the dog species. In the polar regions[a] they are covered with thick shaggy hair resembling wool; while in warm countries, as in Barbary, their skin is perfectly smooth, and almost destitute of hair. In the same way, the thick warm wool which we see upon sheep here, changes into *hair* in the torrid zone. Even in the same country the covering of several animals changes with the changing seasons. As Dr. Paley has observed on this subject, "every dealer in hare-skins and rabbit-skins knows how much the fur is thickened by the approach of winter."

[a] The animals of the frigid zones, generally speaking, are covered with rich fur, which not only protects them from the extreme cold of these regions, but supplies man with articles of comfort and luxury.

As it would be impossible in our limited space to give even a brief outline of the animal kingdom, we shall conclude this chapter by giving a general view of the great divisions into which animals are usually classed.

DIVISION OF ANIMALS.

There are, generally speaking, four[a] great divisions of ANIMALS, namely, *Vertebrated, Molluscous, Articulated, and Radiated.*

The *first division* includes all those animals which have a *back-bone*, for such is the meaning of the term *vertebrated.*[a] It is subdivided into four classes. 1. *Mammalia*, or animals which suckle their young. 2. *Birds* of all kind. 3. *Reptiles*, as serpents of every kind; also crocodiles, alligators, lizards, tortoises, turtles, toads, and frogs. 4. *Fishes* of every kind, except the whale species.

The *second division* includes animals which have no bones, and hence the term *molluscous*, which is from a Latin word signifying *soft.* But with few exceptions, the animals of this class are enclosed in hard shells. There are six classes in this division, but we shall mention those only which are classed according to the form of their shells, namely, *Univalves,*[b] as snails and whelks; *Bivalves,*[c] as oysters, cockles, &c.; and *Multivalves,*[d] as the common barnacle.

The *third division* consists of *Articulated*[e] animals, that is, animals which have an articulated or *jointed* structure. This division contains four classes, namely—1. *Annelides,*[f] or those that have a *ringed* structure, as leeches, centipedes, and earthworms. 2. *Crustacea*, or those that have their soft bodies and limbs protected by a hard coating or *crust*, which in popular language we also call shell, as lobsters, crabs, prawns, and locusts. 3. *Spiders*, which form a class by themselves. 4. *Insects*, as flies, wasps, bees, and butterflies.

The *fourth division* consists of animals having an anatomical structure like an assemblage of *rays* diverging from a common point or centre, from which circumstance they are called *radiated*[g] animals. It contains five classes or subdivisions, one of which only we shall mention, namely, the *Zoöphites,*[h] or animal plants; so called because they are fixed to the ground in the form of a shrub, or branch, or leafy plant. *Corals* and *sponges* belongs to this class.

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[a] A more general division of ANIMALS is into *Vertebrated* and *Invertebrated.* The term *vertebrated* is from *verto*, to *turn*, in allusion to the *joints* of the back.

[b] *Univalve*, one valve or shell. [c] *Bivalve*, two valves or shells.

[d] *Multivalve*, many valves or shells.

[e] From the Latin *articulus*, a little joint.

[f] From the Latin *annulus*, a ring.

[g] From the Latin *radius*, a ray. The *star-fish* is a good example of this division.

[h] *Zoöphites*, from two Greek words, signifying *animal* and *plant.*

CHAPTER XV.

DISTRIBUTION OF MAN.

THE earth was made for MAN; and hence he is found in every country and in every climate,[a] from the torrid regions of Africa and America to—

> "Farthest Greenland—to the pole itself,
> Where, failing gradual, life at length goes out."

On the banks of the Senegal the human body supports a degree of heat which causes the spirit of wine to boil; in the regions of the poles it sustains a degree of cold which causes mercury to freeze.

"The HUMAN ANIMAL," Dr. Paley observes, "is the only one which is naked, and the only one which can clothe itself. This is one of the properties which render man an animal of all climates and of all seasons. He can adapt the warmth or lightness of his clothing to the temperature of his habitation."

Another quality which enables man to live in every climate is, that he has been made capable of deriving nourishment from every kind of food. Without this physical capability—or, in other words, if man were not an *omnivorous* animal—he could not occupy and have dominion over the whole earth. In the frigid zone, except in those parts which border on the temperate regions, there is neither seed-time nor harvest, nor vegetable food of any kind; and the inhabitants are consequently confined to animal food.[b]

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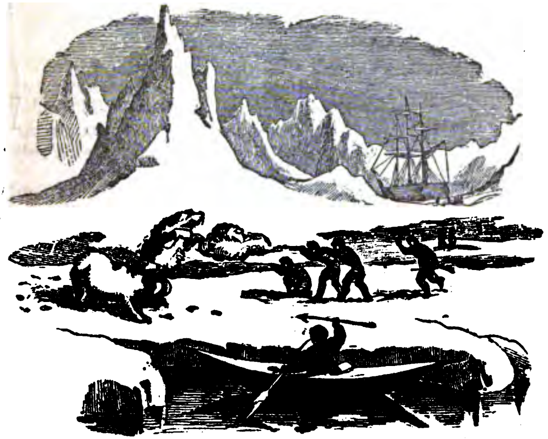
[a] The Esquimaux of Greenland dwell as far north as the seventieth degree of latitude; while in the southern hemisphere, a wretched race of men (the Petcheres) exists on the bleak and barren shore of Terra del Fuego.

[b] It is to the sea in those regions that man is chiefly indebted for his support. Its temperature, as we have already stated (page 125), is milder than that of the land; and it teems with fish, seals, and other aquatic animals, which supply the inhabitants of those sterile regions with food, light, and fuel.

> ——"The teeming seas supply
> The food their niggard plains deny."

The great walrus or sea-horse is found in herds upon the ice; and the whale, the monarch of the ocean, makes this his chosen resort. The oil of these animals is most useful to the inhabitants of those dark and dreary regions; and their fur or skins, particularly of the bear and the seal, are most valuable for clothing and other useful purposes.

In the torrid zone, on the contrary, man lives almost entirely upon vegetable food, which is the only kind of diet suited to the climate. But it is in the temperate regions that man is really an omnivorous animal. In these climates every kind of food is produced, and man partakes of it all.



Some naturalists have thought it possible to class mankind according to the diversity of their food: as *carnivorous* (flesh-eaters), *ichthyophagists* (fish-eaters), *frugivorous* (fruit and corn-eaters), &c.; but such a classification would evidently be partial in its application and erroneous in principle. The Scriptures inform us that all the inhabitants of the earth are descended from a single *pair*; and though to us no additional proof is required on this point, yet it is satisfactory to know that the investigations of physiological and anatomical science have demonstrated that, however dissimilar men may be in external appearance, habits of life, physical power, and intellectual capacities, their *internal structure* is the same; or, in other words, that they all belong to the *same species*.

In the animal and vegetable world we find great varieties in the form, appearance, and qualities of individuals of the same species, for some of which we are utterly unable to

account; and even to children of the same family this observation is often applicable.

> "There's some *peculiar* in each leaf and grain,
> Some unmark'd fibre, or some varying vein."

Can we wonder then at the great varieties that have arisen among men since the world began, scattered as they have been over every country, climate, and soil?[a]

Some naturalists have divided mankind into *three* distinct races or varieties; some into *five*; while others have augmented the number to *seven*, and even to *ten*. The colour of the skin, quality of the hair, form of the features, and shape of the skull, are the traits by which the different races of men are generally distinguished.

DIFFERENT RACES OF MEN.

Caucasian or European. Mongolian or Asiatic. Ethiopian or African. Indian or Native American. Malay.

[a] "The difference between the most dissimilar characters, between a philosopher and a common street porter, for example, seems to arise not so much from nature as from *habit*, *custom*, and *education*. When

The HUMAN FAMILY is usually divided into five great branches or varieties, namely, the *Caucasian* or European, the *Mongolian* or Asiatic, the *Ethiopic* or African, the *Malayan*, and the *Indian* or native American. The colour of the skin is so different in each of these races, that a good *popular* division of them, and consequently of the whole human family, would be into WHITE, YELLOW, BLACK, BROWN, and RED MEN. We shall add the chief characteristics of each race.

The CAUCASIAN RACE was so called on the supposition that they originally came from the valleys of the *Caucasus*, between the Black and Caspian Seas—a region not far distant from the cradle of mankind. This supposition is countenanced, if not confirmed, by the fact that the distinguishing features of this race are found, even at the present day, in the greatest perfection among the inhabitants of those primitive regions. The Georgians and Circassians, for instance, afford perfect specimens of it.[a]

The *Caucasian* race is distinguished from all the rest by a natural complexion of white, tinged with red; as in infants, and in persons not exposed to the influences of the sun and air.[b] Generally speaking, the head is round, the forehead expanded, the face oval, the nose thin, straight, or slightly aquiline, the mouth small, and the chin full and rounded. The hair varies in colour from fair to black, and is generally soft, flowing, or slightly curled; and the eyes from blue to dark brown.[c]

The *Caucasian* race includes the whole European family (except the Laplanders and Finns) with their descendants in America, &c.; also the nations of Western Asia, as far as the river Obi, the Beloor

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they came into the world, and for the first six or eight years of their existence, they were, perhaps, very much alike, and neither their parents nor playfellows could perceive any remarkable difference. About that age, or soon after, they come to be employed in very different occupations. The difference of talents comes then to be taken notice of, and widens by degrees, till at last the vanity of the philosopher is willing to acknowledge scarce any resemblance."—ADAM SMITH.

[a] Mr. M'Culloch combats the general opinion upon this point. See his Geographical Dictionary (article EUROPE).

[b] The Caucasians are of all complexions, according to the *climate*—but white is the natural colour. Thus a native of Northern Europe is fair; of Central, less so; of Southern, swarthy; a Moor more so, an Arab olive, and a Hindoo nearly black. Such of the Hindoo women as have never been exposed to the sun, are often as fair as the inhabitants of the south of Europe.

[c] Fair and auburn hair, and blue eyes, are peculiar to the Caucasian race.

Tag and Himalaya Mountains, and the Ganges; and the people of northern Africa, Egypt, and Abyssinia.[a]

The MONGOLIAN RACE comprises the natives of Asia beyond the Obi, the Beloor Tag, and Himalaya Mountains, and the Ganges (except the inhabitants of Malacca); as the Mongolians, the Chinese, the Japanese, the people of Thibet, Boutan, and Indo-China, the inhabitants of the Arctic regions; as the Samoieds, Kamtschatdales, Finns, Laplanders, and Esquimaux. The chief characteristics of this race are, the skin yellow or olive, the head almost square, the forehead low and narrow, the face large and flat, the nose small and flat, the mouth wide, the lips thick, the chin pointed, and the cheek-bones prominent. The hair is coarse, lank, black, and thin; and their eyes small, black, and rising in an oblique line from the nose to the temples.

The ETHIOPIC or NEGRO RACE comprises all the natives of Africa to the South of the Sahara and Abyssinia; also the natives of New Holland, Van Diemen's Land, Papua or New Guinea, New Britain, Solomon Isles, New Georgia, the New Hebrides, New Caledonia, the Feejee Islands, and also various tribes in the Indian Archipelago. The chief characteristics of this race are—the skin black; the head narrow and compressed at the sides; the forehead low and retreating; the cheek-bones prominent; the nose large and flat; the lips thick, particularly the upper one; the jaws narrow and projecting; the chin small and retracted; the eyes black; and the hair black, coarse, frizzled, and woolly.

The MALAY RACE includes the natives of Malaya, Ceylon, the Asiatic Islands, New Zealand, and Polynesia. In this race the skin is brown or tawny; the form of the head intermediate between that of the European and Ethiopic races; the forehead a little arched or rounded; the nose full and broad, and thick towards the point, or what is called a bottle-nose; the upper jaw somewhat less projecting; and the features generally more prominent than in the negro; the eyes black; and the hair black, coarse, curled, and abundant.

The INDIAN or AMERICAN RACE comprises all the native American tribes, except the Esquimaux. The colour of their skin is reddish, resembling that of copper or cinnamon; the forehead is short and depressed; the eyes sunk; the face broad, without being flat; the nose rather flat, but prominent; the nostrils very open; the cheek-bones high; the beard thin and scanty; and the hair black and lank.

The Malay race approximates to the Ethiopic, and the Indian to the Mongolian.

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[a] The Jews, the ancient Egyptians, the Arabs, the Babylonians, Assyrians, Medes, Persians, Afghans, Turks, Armenians, Hindoos, &c., belong to the *Caucasian* race. See under the description of Europe for the chief characteristics of the Caucasian race.

QUESTIONS FOR EXAMINATION.[a]

Page 7.—The meaning of the term Geography? 2. How may Geography be divided? 3. What is Mathematical Geography? 4. With what other sciences is this branch of Geography connected? 5. What is Physical Geography? 6. With what other sciences is this branch of Geography connected? 7. What is Political Geography? 8. With what other sciences is this branch of Geography connected?

Pages 8, 9.—The form of the earth? 2. What is a *sphere?* 3. An *oblate* spheroid? 4. A *prolate?* 5. How would you illustrate the form of the earth? 6. How the *axis* and *diurnal* motion? 7. If the earth is a globe, why does not its surface appear *globular?* 8. How illustrate this? 9. If a person six feet high stood in the middle of an extensive plain, how far could he see the *surface* of the earth around him? 10. Why are mountains and inequalities upon the earth's surface no argument against its sphericity? 11. What would be the size of the highest mountain in the world, if represented in relative proportions upon the surface of an artificial globe 12 inches in diameter? 12. How do you show this? 13. The *practical* proof of the sphericity of the earth? 14. How illustrate what is meant by sailing round the world?

Pages 10, 11.—The first person who attempted to circumnavigate the earth? 2. The first who succeeded? 3. Can you state the arguments which led Columbus, and others long before his time, to conclude that the earth must be a *sphere?* 4. Is sailing round the world from west to east, or *vice versa*, a proof of its *sphericity?* 5. How is it shown that the earth's surface is *globular* from north to south also? 6. The proof from the eclipses of the moon? 7. Can you state other and more familiar proofs of the earth's sphericity in every direction? 8. Why should the hull or body of a ship continue longer in sight than the masts? 9. Why do sailors go aloft when they are on tne look-out for land, or for any distant object? 10. How show that the form of the earth must be *spherical?*

Pages 12, 13.—The nature of attraction? 2. The different kinds or modifications of attraction? 3. Without the attraction of *cohesion*, what would take place? 4. Can you repeat the lines in illustration of the preceding question? 5. How is the same principle exemplified in the rain and dewdrops? 6. Also in the *globules* of quicksilver? 7. And in the manufacture of small shot? 8. Why in a globe or spherical body is the attraction of all the parts in the direction of the centre? 9. How apply this to the original formation of the earth? 10. Under what circumstances would the earth, or any round body like it, remain self-balanced in pure space? 11. What is meant by the centre of gravity of a body? 12. Do the centre of gravity and the centre or middle point in a globe or spherical body coincide? 13. The lowest part or point in a globe? 14. The meaning of the terms *up* and *down*, as applied to the earth? 15. As applied to the heavens? 16. The meaning of the term *antipodes?* 17. In what direction is every part of the

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[a] A *careful perusal* of the text will enable the pupils to give satisfactory answers to these questions. See the *Preface*.

earth, and every thing and every person on its surface attracted? 18. Why in the direction of the centre?

Pages 14–16.—How illustrate the *diurnal* motion of the earth? 2. Why is one-half of the earth always enlightened? 3. Why day and night alternately? 4. Why in the course of twenty-four hours? 5. What is meant by the term *poles?* 6. Why the *north* pole called upper? 7. How illustrate the poles by making an orange or top spin round? 8. Why do the sun and heavenly bodies *appear* to revolve from east to west in twenty-four hours? 9. How illustrate these apparent motions? 10. What are the arguments against the supposition that the sun revolves round the earth? 11. If the sun revolves round the earth every twenty-four hours, what must be the circumference of the circle he would have to describe daily? 12. How do you show this? 13. What idea can you give of the *number* of the fixed stars? 14. What, of their *distance?* 15. What the inference from these facts? 16. How much is the sun larger than the earth? 17. Is there any thing known of the magnitude of the fixed stars? 18. What are they supposed to be? 19. A *planet* appears brighter and *larger* if viewed through a telescope, is this the case with a fixed star? 20. How do you account for this?

Pages 17–20.—The *seasons* caused by? 2. What is meant by the *orbit* of the earth? 3. The *plane* of the earth's orbit? 4. How illustrate them? 5. Are we to suppose that the *orbit* of the earth is a solid or substantial ring, or that its *plane* is a real, visible, flat surface? 6. How illustrate what has been said? 7. The *equator?* 8. Why so called? 9. Into what does it divide the globe? 10. In what direction does it run? 11. If the axis of the earth were not inclined to the plane of its orbit, what would be the consequence? 12. What is the measure of the angle made by the axis of the earth with the plane of its orbit? 13. What do you understand by the axis moving parallel to itself? 14. What is the consequence of this? 15. When the *northern* half of the axis is inclined to the sun, what is the consequence? 16. When the axis of the earth neither inclines to nor declines from the sun, what is the consequence? 17. How illustrate what has been said?

Pages 21–23.—Can you explain the diagram in this page? 2. In what position is the earth with regard to the sun at midsummer? 3. Midwinter and the equinoxes? 4. When the sun is vertical to the tropic of Cancer, how far does he shine over the north pole? 5. Why? 6. Over what part of the earth is the sun vertical, when his rays are withdrawn from the north frigid zone? 7. When the sun is vertical ten degrees north of the equator, how far does he shine over and beyond the north pole? 8. In this position of the earth, how much of its surface round the south pole is deprived of his light? 9. Over what part of the earth is the sun vertical, when he shines from pole to pole? 10. What is a *great* circle? 11. The illustration given in the note? 12. What is meant by the *circle of illumination?* 13. Why does it always bisect the equator? 14. The consequence of this? 15. At what periods of the year are the *parallels* bisected by the circle of illumination? 16. Why at those periods are the days and nights equal all over the world? 17. When the sun is *north* of the equator, is there more or less than half of each of the parallels within the circle of illumination? 18. When the days are *sixteen* hours long at any place, how much of the parallel of latitude of that place is within the circle

of illumination? 19. How illustrate the circle of illumination? 20. In what position would the earth be if the circle of illumination coincided with the *equator?*

Pages 24, 25.—The advantage of getting a clear idea of what is meant by the circle of illumination? 2. Can you explain how it is possible that the pole of the earth always points in the direction of the pole of the heavens, while travelling round in an orbit *one hundred and ninety millions of miles in diameter?* 3. Over what part of the earth is the sun vertical on the 21st of June? 4. On the 20th of March? 5. On the 22nd of September? 6. During the winter solstice? 7. Why are the Arctic and Antarctic circles described at the distance of 23½ degrees from the poles.

Pages 26, 27.—The arguments in proof of the earth's motion round the sun? 2. The illustrations? 3. How may the sun's apparent motion to the *eastward* be observed? 4. What progress does he appear to make every twenty-four hours? 5. When the earth is in Libra, in what sign is the sun? 6. When the earth is in Scorpio, in what sign is the sun? 7. The *ecliptic?* 8. Why so called? 9. How illustrate it? 10. What is an *eclipse?* 11. How illustrate the principle of an eclipse of the sun? 12. Of the moon? 13. The origin of the division of the circle into the 360 degrees? 14. What is the *zodiac?* 15. The *signs* of the zodiac? 16. Can you repeat the twelve signs? 17. When is the sun in Aries? 18. When in Taurus? 19. When is the sun in Libra? 20. In what sign is the earth when the sun is in Capricorn? 21. Why are there not two eclipses every month? 22. By what argument is it proved that a body projected into pure space will continue in motion for ever, in a straight line, and with uniform velocity? 23. Can you state the argument?

Pages 28–33.—Can you explain by a diagram the causes of the earth's annual motion? 2. Can you go through the demonstration in this and the preceding page? 3. By what combination is the *circular* motion of the earth and the other *planets* produced? 4. What other names are given to the forces of projection and attraction? 5. The meaning of the terms *centrifugal* and *centripetal?* 6. If the earth at its creation had been projected *towards* or *too near* the sun, what must have happened? 7. If *too remote* from the sun, the consequences? 8. What is an *ellipse?* 9. Why is the orbit of the earth *elliptical?* 10. The meaning of the term *Aphelion?* 11. *Perihelion?* 12. Can you go through the preceding demonstration? 13. In what part of her orbit is the earth when the *centripetal* force is greatest? 14. In what part, when it is least? 15. How is it that the *centrifugal* force prevails over it in the former case, and yields to it in the latter? 16. Does the orbit of the earth differ much from a circle? 17. Why has it been given so elliptical in the diagram? 18. The difference in length between the longer and shorter axis or diameter of the earth's orbit? 19. Why is this difference almost nothing? 20. Is the earth as near the sun in winter as it is in summer? 21. How do you explain this? 22. How do you illustrate this by the *polar* summer? 23. The warmest time of the day? 24. Why? 25. The warmest time of the year? 26. The coldest time of the night and year? 27. Why is the sun when rising—on the meridian—and setting—at the same distance from us?

Pages 34, 35.—How is the magnitude of a spherical body ascertained? 2. Meaning of the terms *diameter* and *circumference?* 3. How is the

length of the circumference of the earth ascertained? 4. How, the length of the diameter? 5. The length of a degree on the earth's surface? 6. Why is the equator a *great* circle? 7. How does it divide the globe? 8. Can you explain the circles in the diagram?

Pages 36–38.—The *latitude* of a place? 2. In what latitude is the entire northern hemisphere? 3. In what, the southern? 4. Does the latitude of a place give you its precise position? 5. What other measurement is necessary? 6. What is a *meridian?* 7. *First* meridian? 8. On what is latitude measured? 9. How many degrees in the quadrant of a circle? 10. How many miles in the quadrant of a meridian circle? 11. How is latitude measured? 12. What is meant by the *universal* meridian? 13. Parallels of latitude? 14. Why called *parallels?* 15. Why parallels of *latitude?* 16. How many usually drawn? 17. How many might be drawn?

Pages 39–41.—What is *longitude?* 2. The first meridian? 3. All nations count *latitude* from the same place; is there the like unanimity with respect to *longitude?* 4. How is this explained? 5. On what circles is longitude measured? 6. Why is longitude reckoned on the equator? 7. Are the terms *longitude* and *latitude* properly applied to a *spherical* body? 8. Why originally applied to the earth? 9. Are they, strictly speaking, applicable to the earth? 10. Why was the *Mediterranean* Sea so called? 11. The latitude of a place really is? 12. In what way are the meridians made to assist in determining the longitude? 13. The length of a degree depends upon? 14. If a circle is 360 feet in circumference, what will be the length of a degree? 15. Why? 16. The length of a degree on the earth's surface? 17. Why is a degree on the equator longer than a degree on any of the parallels? 18. Why are the degrees of longitude of unequal length? 19. Why the degrees of latitude, generally speaking, of equal length? 20. How are the degrees of latitude reduced to miles? 21. How the degrees of longitude? 22. Can you state the nature and use of the *table* referred to?

Pages 42–44.—How far is longitude counted round the globe? 2. How far is latitude? 3. The extremes of latitude, north and south? 4. If one person is 180° E. longitude, and another 180° W. longitude, and on the same parallel, how far are they from each other? 5. How do you show this? 6. Strictly speaking, are the degrees of latitude of equal length? 7. Can you describe the principle of Sir Isaac Newton's theory as to the true form of the earth? 8. Can you give the proofs and illustrations added in the note? 9. A degree of a meridian near the polar circles is how much longer than a degree of the same meridian near the equator? 10. The cause of this? 11. The consequence of this? 12. In what direction do the degrees of latitude get longer? 13. Is the difference worth taking into account practically? 14. The degrees of longitude become shorter in what direction, and in what proportion? 15. How do you show that the latitude of a place in the northern hemisphere always corresponds to the altitude of the polar star, as observed from that place? 16. In what part of the earth would we be, if the polar star were in our zenith? 17. What would its *altitude* and our *latitude* be in this case? 18. At 45° N. latitude, what is the altitude of the polar star? 19. At 53°? 20. At the equator? 21. In what part of the earth would a person be, from which if he moves, no matter in what direction, he is going *southward?*

Pages 45–47.—How measure a degree upon the earth's surface? 2. How find the circumference and diameter of the earth? 3. How much is the equatorial diameter of the earth longer than the polar? 4. How may the latitude of a place be found by the meridian altitude of the sun? 5. Why does our zenith distance from the celestial equator give us our latitude? 6. Why does the distance between the celestial equator and the poles of the heavens correspond to the distance between the terrestrial equator and the poles of the earth? 7. In what part of the earth would we be, if the celestial equator were in our zenith? 8. Where, if it coincided with our rational horizon? 9. What would be our latitude in each of the preceding cases? 10. What would be our latitude if our zenith were 45° from the celestial equator? 11. What is DECLINATION, and to what does it correspond? 12. How may our zenith distance from the celestial equator be found? 13. What is the sun's declination on the 21st of June? 14. When is the sun's south declination greatest? 15. When has the sun no declination? 16. How may the latitude of a place be found by taking the meridian altitude of the moon, or of any fixed star, whose declination is known?

Pages 48–50.—How is longitude found at sea? 2. Why is time *earlier* towards the *east?* 3. And why in the proportion of one hour to 15 degrees? 4. When it is 10 o'clock with us, what will be the hour with persons residing 15 degrees to the *east* of us? 5. What with persons residing 45 degrees to the *west* of us? 6. How do you show this? 7. By knowing the difference in the *time* of any two places we can determine? 8. And by knowing the difference in their *longitudes* we can determine? 9. How many meridians usually drawn upon globes and maps? 10. Why 24? 11. If a meridian is drawn through every 10 degrees, every meridian corresponds to how much time? 12. What is meant by a *chronometer?* 13. The use of it in determining the longitude? 14. If it is 12 o'clock by our watches, as regulated by the sun, and only 10 by the chronometer, which gives London time, what is our distance from the first meridian, and in what direction is it from us?—or, in other words, what would be our longitude? 15. Suppose it were 4 o'clock by the chronometer when it is 2 by us, what would be our longitude? 16. Why other methods for finding the longitude resorted to? 17. In what way have the eclipses of Jupiter's satellites been made available for the purpose? 18. Can you give an instance? 19. Is this method practicable at sea? 20. Why not?

Pages 51–53.—How is the distance between two places on a globe or map found? 2. If on the same meridian and in the same hemisphere? 3. If in different hemispheres? 4. If on the same parallel and on the same side of the first meridian? 5. If on different sides of the first meridian? 6. How are the degrees of latitude reduced to miles? 7. How the degrees of longitude? 8. Can you state the principle of the *lunar* method? 9. In what part of the earth may the degrees of longitude be multiplied by 60 to bring them to miles? 10. Why? 11. Strictly speaking, is the equator greater than a meridian circle? 12. In the latitude of Dublin how many miles in a degree of longitude? 13. How find the distance between Dublin and Manchester? 14. How find the distance between any two places on a globe or map without regard to their latitudes or longitudes? 15. The shortest distance between any two places on a globe? 16. Why, if carried to the equator, will this give the distance between them? 17. In maps on which the

equator is not represented, how measure the distance between any two places? 18. Why not take the degrees at the *top* or *bottom* of the map? 19. Given the difference in time between any two places, how may the difference in their longitudes be found? 20. And *vice versa?* 21. The length of a degree of longitude at the equator? 22. At the poles? 23. In latitude 45°? 24. In latitude 53°? 25. In latitude 60°? 26. At the polar circles?

Pages 54–57.—What causes a diversity of temperature? 2. Where and when is it greatest? 3. The meaning of the terms *zone* and *climate?* 4. How many zones? 5. Their names? 6. Why so called? 7. The boundaries of each zone? 8. The extent of each in degrees? 9. Why will not the extent in degrees give their real magnitudes? 10. Can you give an estimate of their comparative magnitudes? 11. The necessity for a further division of the earth's surface with regard to temperature? 12. What may climates be regarded as? 13. The principle upon which the division into climates is made? 14. In what part of the earth are the days and nights equal throughout the year? 15. How many climates between the equator and each of the polar circles? 16. Why 24? 17. From the polar circles to the poles the climates are reckoned not by *half hours* but by? 18. Why by *months?* 19. Why six climates between the polar circles and the poles? 20. Why is the division of the earth into climates not much regarded now? 21. Can you give an example of this? 22. The difference between the temperature of Labrador and Ireland in the same latitude? 23. The inference from this and similar facts? 24. The temperature of a place generally depends upon? 25. How is this general principle modified? 26. What are the cities mentioned as having the same mean temperature though at very different distances from the equator? 27. How do you explain this? 28. Why the northern parts of North America and Asia colder than places in the same latitude in Europe? 29. Why does a declivity towards the equator increase the temperature? 30. Can you state the facts and illustrations given in the notes? 31. Why the north of Africa and south of Europe warmer than the same latitudes in America and Asia? 32. How do periodical and prevailing winds affect climate? 33. How large tracts of water? 34. What effect has an *insular* situation upon climate? 35. Give examples?

Pages 58–60.—What is meant by *isothermal* lines? 2. The necessity for them? 3. How is their direction generally determined? 4. In what part of the earth do they, generally speaking, coincide with the parallels of latitude? 5. Why is their course irregular in higher latitudes? 6. Why will an isothermal line of any given temperature recede farther from the equator in Europe than it will either in America or Asia? 7. And why in the *maritime* parts of Europe than in the *continental* or *elevated* regions? 8. The mean temperature of the earth at the equator? 9. And at 20° north or south of it? 10. Can you state the most important isothermal lines? 11. Can you describe the seven *vegetable* zones into which the isothermal lines specified divide the earth's surface? 12. Is it meant that the plants and vegetables here specified are confined to those particular regions? 13. Can you give a description of the several vegetable zones which you might expect to meet with in ascending a lofty mountain in the *torrid zone?* 14. What is said of Teneriffe, Mount Ararat, and Etna?

Pages 61, 62.—What is meant by *Isotheral* and *Isochimenal* lines?

2. The necessity for them? 3. Give examples. 4. The difference between the mean summer and mean winter temperatures of places increases as? 5. Give examples from the annexed table?

Pages 63–66.—What is meant by the *snow-line?* 2. Generally speaking, where is it highest? 3. Where does it touch the surface? 4. Its height at the equator? 5. At 20 degrees from the equator? 6. Its height in our latitude? 7. Is the height of the snow-line in different latitudes accurately ascertained? 8. How might a person at the equator experience the cold of the frigid zones? 9. Can you explain why the snow-line is higher at 20° from the equator than it is at it? 10. Can you explain why the temperature decreases in proportion to the elevation? 11. Why do we feel warmer walking along the paved streets of a town than we should if walking through a field in the country? 12. Why should we expect the snow-line to be lower in the southern than in the northern hemisphere in equal latitudes? 13. What has Humboldt said respecting the temperatures of the two hemispheres? 14. Can you give examples of the difference of temperatures in the same latitudes? 15. How do you show by the habitations of men that the southern hemisphere is colder than the northern? 16. Can you state the three causes assigned for the difference in the temperatures of the northern and southern hemispheres? 17. Why is the sun nearly eight days in the year longer on the northern side of the equator than he is on the southern?

Page 67.—The utility of mountains? 2. How are springs, brooks, and rivers formed? 3. Can you state generally the great importance of mountains? 4. How many classes of mountains? 5. Can you give the general height of each class? 6. In which class are the highest mountains in Europe? 7. In which class the highest in Ireland? 8. The highest terrestrial elevation attained by man? 9. The highest balloon ascent? 10. The elevation of Quito?

Pages 71–74.—The principal mountains of Asia? 2. Trace them out on the map, and state what you know of them?

Pages 75–78.—The principal mountains of America? 2. Trace them out on the map, and state what you have read about them?

Pages 79–88.—The principal mountains in Europe? 2. Point them out on the map, and state what you have read about them. Into how many distinct systems might the mountains of Europe be divided?

Page 89.—The principal mountains of Africa? 2. State what you know of them?

Page 90.—What is a *table-land* or *plateau?* 2. The principal and most remarkable in the world? 3. Their effect upon climate?

Pages 91–94.—What is meant by a *plain?* 2. Plains are either? 3. What specimens in this country of barren or uncultivated plains? 4. Where are we to expect the largest plains? 5. Can you describe the great plain which extends over the north and north-east of Europe? 6. Has it no elevations? 7. The height of the Valdai Hills? 8. Can you describe the *steppes* of Russia? 9. The *puszta* of Hungary? 10. Where are the *Pontine Marshes?* 11. The meaning of the terms *Netherlands* and *Holland?* 12. What is the extent of the great plain of Hungary? 13. The meaning of the term *desert?* 14. Are there any in Europe? 15. Why not? 16. The largest and most remarkable in the world? 17. The meaning of the term *Sahara?* 18. Can you give a general description of it? 19. The *oases?* 20. To what

did the ancients compare them? 21. The dangers and difficulties in crossing the Sahara? 22. What are the *camels* called? 23. Why are travellers obliged to direct their course by the stars or by the compass? 24. Can you give an instance of the calamities which occur in crossing the Sahara? 25 Why need we not describe the *deserts* of Arabia. Syria, and Persia? 26. The extent of the Great Salt Desert in Persia? 27. Where are the deserts in Hindostan, and what is said of them? 28. The Great Desert of Asia? 29. The Shamo? 30. The extent of the desert of Gobi? 31. Of the Shamo? 32. How does the Shamo differ from the *saharas* of Africa and Arabia? 33. Where is the great American Desert? 34. Its extent and character? 35. The *savannahs* and *prairies* are generally covered with? 36. Where are they most numerous? 37. Can you describe the great plains in America? 38. The *llanos?* 39. The *pampas?* 40. The *savannahs* and *prairies?* 41. *Pine barrens?* 42. *Selvas?* 43. What description does Humboldt give of the llanos of Venezuela? 44. Are the wild cattle spoken of as indigenous? 45. The origin of rivers? 46. The size and character of a river depend upon? 47. The extent of the basin of the Amazon? 48. The velocity of rivers depend upon? 49. How are *cascades* and *cataracts* formed?

Pages 95–97.—How are rivers often carried over plains? 2. Can you give instances of this? 3. How do rivers differ with regard to their mouths? 4. The breadth of the estuary of the La Plata? 5. What produces floods periodically in some rivers? 6. Can you repeat the instances mentioned in the text? 7. The danger from floods? 8. The utility of them? 9. What does Gibbon say of the Nile? 10. Can you describe the several classes into which rivers have been divided? 11. Has the length of rivers been accurately ascertained? 12. How should these rivers be studied? 13. In what class is the largest river in Europe? 14. In which the largest in Ireland and England?

Pages 98–100.—How are *lakes* classed? 2. Give examples of each kind. 3. The most usual class? 4. Such lakes may be considered expansions of? 5. Can you give instances? 6. How do lakes of the *fourth* class generally differ from the others? 7. Where the Natron lakes? 8. What is said of Lake Zirknitz? 9. And of Xarayes? 10. How is this accounted for? 11. The largest lake in the world? 12. Its area in square miles? 13. The area of Lake Superior? 14. Of Geneva? 15. Lough Neagh? 16. Windermere? 17. What have you to observe regarding Nicaragua?

Pages 101–104.—The tides are caused by? 2. Can you describe them? 3. Why not two tides every twenty-four hours? 4. How much the tides later every day? 5. Why? 6. How are the waters of the sea preserved from putrefaction? 7. Can you show how the tides are produced? 8. Why is the tide not at its highest when opposite to the moon? 9. How illustrate this by the facts referred to in the note? 10. How is it that the waters on the side of the earth, *nearest* and *farthest* from the moon, are equally raised in tides at the same time? 11. The illustration? 12. Can you explain the tides by a diagram? 13. Can you show how the *spring* and *neap* tides are caused? 14. When have we *spring* and when *neap* tides? 15. Why are the tides higher towards the equator? 16. Where are the tides most regular? 17. What produces irregularities in the time and height of tides? 18. Why tides almost imperceptible in the Mediterranean and the Baltic? 19. Why

regular, and often very high tides in Baffin's and Hudson's Bay, and in the Red Sea? 20. Where do tides often rise dangerously high? 21. Why is it high water sooner on the western than on the eastern coasts of the British Islands? 22. What is meant by the *tidal wave?*

Pages 105–110.—The use of *currents* in the ocean? 2. Can you describe the great EQUATORIAL CURRENT? 3. Can you give a description of the GULF STREAM? 4. The velocity of the gulf stream? 5. How distinguished from the water round it? 6. How the gulf stream instrumental in leading to the discovery of America? 7. The *South Connecting* current? 8. Can you describe the great equatorial current in the Pacific Ocean? 9. The *Mozambique* current? 10. The *Agulhas* current? 11. How the existence of the POLAR CURRENTS proved by the failure of Captain Parry's attempt to reach the north pole? 12. Why navigation dangerous in the northern parts of the Atlantic? 13. Can you give a familiar illustration of the causes which produce the polar currents? 14. How the inhabitants of Iceland supplied with much of their fuel? 15. The *Antarctic* current? 16. The *Peruvian* current? 17. Why do the polar currents, as they approach the *equatorial* parts of the earth, take a *westerly* direction? 18. What is said of CONTRARY and UNDER currents? 19. How are EDDIES and WHIRLPOOLS formed? 20. Can you describe the Maelstrom? 21. Where Charybdis? 22. The utility of currents?

Pages 111–114.—The ATMOSPHERE? 2. Its uses? 3. Its constituent parts? 4. Can its height be exactly determined? 5. What is meant by REFLECTION and TWILIGHT? 6. How produced? 7. The duration of twilight varies with? 8. Why shortest in the equatorial parts of the earth? 9. Why longest in the polar regions? 10. When the sun's rays are withdrawn from the polar regions are the inhabitants left in total darkness? 11. What in some measure compensates for his absence? 12. Repeat the verses in illustration? 13. REFRACTION? 14. How produced? 15. Its effect and utility? 16. Its amount at the horizon? 17. At the zenith? 18. How do you prove that when we see the lower edge of the sun or moon resting upon the horizon its whole disk is in reality below it? 19. State the note in reference to this? 20. Describe the experiment in illustration? 21. How else may refraction be familiarly illustrated? 22. Weight of the atmosphere? 23. How ascertained? 24. Upon what principle is the common PUMP constructed? 25. The BAROMETER? 26. The pressure of the atmosphere upon every square inch of the earth's surface? 27. How is this shown? 28. The amount of its pressure upon the body of an ordinary sized man? 29. How are we enabled to support this enormous pressure without inconvenience?

Pages 115, 116.—Why do the vapours ascend? 2. When do they become stationary? 3. When visible? 4. In what form? 5. How are the *clouds* classified? 6. *Mists* or *fogs?* 7. How and where do they render navigation dangerous? 8. *Evaporation*, how produced? 9. Describe the circulation of waters that is constantly going on, for the benefit of mankind, between the sea, the sky, and the earth?

Pages 117–119.—In what parts of the earth is rain most abundant? 2. Why should we expect this to be the case? 3. The computed annual average quantity of rain in the torrid zone? 4. In the north temperate zone? 5. What is meant by inches of rain? 6 What mark of design is there in the different quantities of rain that fall in different

parts of the earth? 7. In what parts of the earth is rain most frequent, or the number of *rainy* days most? 8. How is this illustrated in the text? 9. How do you account for the regularity of the rain and other phenomena of the atmosphere in the torrid zone? 10. What is a *pluviometer* or *rain-gauge*? 11. How many inches of rain have been collected, in 24 hours, in the torrid zone? 12. In what parts of the world are the *four* seasons distinctly marked? 13. Where are there only *two* seasons? 14. Where only *one*? 15. How is the year divided in torrid and tropical regions? 16. When is it the *dry* and when the *wet* season? 17. The mark of design in this? 18. Can you give Humboldt's description of the effects of these periodical rains and droughts in those regions? 19. The sufferings of the wild horses in the rainy season? 20. Is the horse originally a native of the llanos? 21. In the northern tropical regions of Africa, when do the rains commence, and when end? 22. Describe their effects? 23. In what parts within the tropics are there two rainy seasons? 24. In what two respects do they differ from each other? 25. Have all places under the same parallel their dry and rainy seasons at the same period of the year? 26. What produces this irregularity? 27. Give examples? 28. Are there any places within the torrid zone that have no rainy season? 29. Can you explain this? 30. What is said of Egypt? 31. Generally speaking, in all parts of the world, do equal quantities of rain fall in equal latitudes? 32. What localities are most subject to rain? 33. Can you state the reason?

Pages 120, 121.—What is *dew*? 2. In what regions of the earth, and in what tracts of country in particular, are the dews heaviest? 3. The utility of dew? 4. Can you state what was the opinion formerly regarding the formation of dew? 5. What is the present theory? 6. What are the illustrations given in the text? 7. Should we expect more dew in a cloudy, than in a clear night? 8. Why little or no dew in cloudy nights? 9. Is dew equally distributed over the same localities? 10. How has this been proved? 11. The general inference from this? 12. How is *hoar*-frost produced? 13. Is *mildew* of atmospheric origin? 14. What other forms do the vapours of the atmosphere assume? 15. How is *snow* produced? 16. And how *hail*? 17. If we judge from appearances, what would we conclude regarding the utility of snow? 18. In what two respects is snow stated to be of great use? 19. What is the difference between snow and hail, as to the part of the earth, and seasons of the year in which they fall? 20. How is hail supposed to be produced?

Pages 122–128.—The primary cause of wind? 2. The illustrations given? 3. How winds divided? 4. Trade-winds—why so called? 5. An instance of their utility to navigation? 6. Can you explain the cause of the trade-winds? 7. In what case would the trade-winds blow regularly and constantly in the direction here stated? 8. *Periodical winds*? 9. The *monsoons*? 10. Why so called? 11. Can you explain the cause of the monsoons? 12. When do they blow from the *south-west*? 13. When from the *north-east*? 14. Why along the Gulf of Guinea, southerly and south-westerly winds constantly? 15. Why also on the coast of Peru? 16. Can you explain the *land* and *sea-breezes*? 17. Where the winds, either *permanent* or *periodical*? 18. Where *variable*; and why? 19. What other winds are spoken of?

METHOD OF TEACHING GEOGRAPHY.

[The following ARTICLE is taken from the OUTLINE drawn up by the author for the use of the Teachers in training in the Normal School of the Commissioners of National Education. It, of course, contains his ideas upon a most important part of Geography—THE METHOD OF TEACHING IT. It also contains a great number of important facts connected with Geography, and a general view of the whole subject.]

No treatise on geography has, as yet, been published by the Commissioners.[a] There is, however, a series of lessons on this interesting and useful branch of education in their several reading-books, from which the leading facts and general outlines of geography may be taught. The excellent MAPS, too, published by them, have done more to *popularize* the study of geography in Ireland than any treatise yet given to the public. These maps are in all our schools, and in hundreds of others; and as Dr. Watts has observed in his work "On the Improvement of the Mind,"—"The situation of the several parts of the earth is better learned by one day's conversing with a *map*, than by merely reading the description of their situation a hundred times over in books of geography." A connected and systematic knowledge of geography, however, requires a regular text-book on the subject; and it may be well to state here, that such a work is in preparation for the use of the National Schools.[a] In the meantime, geography is taught in the National model and training schools, by the maps, reading-lessons, and lectures.

Before commencing geography, the pupils should be made acquainted with at least the four cardinal or principal points of the heavens. This may be done in a few minutes. Take them out at *mid-day*, or in other words, at *twelve o'clock*, and tell them that if they look towards the sun, their *faces* will be in the direction of the *south*, their *backs* towards the *north*, their *right* sides to the *west*, and their *left* towards the *east;* and that this is the case *every day in the year at twelve o'clock*. Or lead them to connect the *east* and *west* points of the horizon with that part or quarter of the heavens in which the sun *rises* or *sets*.[b]

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[a] This was written in 1840; and as the work referred to (*Rev. Dr. Carlile's*) did not make its appearance till four years after, the "*Geography Generalized*" was drawn up by the author, in 1843, for the use of his class in the Training School, and subsequently published by him for the use of schools generally.

[b] During the *equinoxes* only, the sun *rises* and *sets* in the *east* and *west* points of the horizon. Between the vernal and autumnal equinoxes, the sun rises and sets *northward* of the *east* and *west* points of the horizon; and between the autumnal and vernal equinoxes proportionally *southward*.

Having fixed these points in their minds, let them return to the school-room, and *begin their first lesson on geography with it.* In which side or wall of the room is the principal entrance? may be asked; and the answer will be, in the *south.* Why? Because it is in the direction of the sun at twelve o'clock. In which side is the rostrum, or master's desk? In the *north.* Why? Because that is *the side opposite to the south.* The *east* and *west* sides of the room will be as easily pointed out; and from the school-room the question may be extended to the play-ground, and to the entire premises. The pupils will readily name the streets that run along or enclose the Education Grounds, on the *south*, *north*, *east*, and *west.* These streets, they should be told, are the northern, southern, eastern, and western *boundaries* of the premises. The question may then be extended to the city generally; as, on which side of the city is Merrion or Mountjoy-square? Which side of these squares is nearest or farthest from us? In what direction is Sackville-street from Marlborough-street? Do they cross at right angles, incline, or run parallel to each other? In what direction from Dublin does Kingstown, Lucan, or Ashbourne lie? Similar questions should be put regarding the *counties* bordering upon Dublin; and thus geography is commenced, as it should be, with TOPOGRAPHY.

The pupils should then be directed to draw a ground-plan of the school-room on their slates. The dimensions should be stated to them,—or, which is preferable, they should be made to measure it themselves. As it is eighty feet in length, by fifty in breadth, they will see the necessity for reducing its dimensions, or for drawing it *on a small scale.* If the scale be *an inch* for every *ten feet*, the drawing will be *eight inches* by *five.* If reduced to a smaller scale, the drawing will, of course, be smaller in proportion. If the plan is to be on an inch for ten feet, let a line an *inch* long be drawn in a corner of it for the *scale* by which the dimensions of the desks, &c., are to be measured and laid down. The desks, which are sixteen in number, and about thirty feet long each, may be represented by parallel lines, three inches long, and one-tenth of an inch broad; and the platform on which the master's rostrum stands, by a parallelogram, two inches by one and a-half inch; and in its proper position in the school-room.

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This is a rude representation of the school-room, *as it would appear to a person looking down from the ceiling*—or, in other words, it is a *map* of the school-room. The pupils may now be introduced to a map of the world, and they will readily conceive that it is intended to represent the earth, *as it would appear to the eye of a spectator raised at an immense distance above it.* But as children naturally fall into the mistake of considering the eastern and western hemispheres, as *plane* and *unconnected* surfaces, they should be told that they are intended to represent a *globe*, divided into two equal parts, and placed

beside each other on a flat surface, or, as the term *hemisphere* denotes, *half* globes. A familiar idea of this may be given to them by dividing an orange, or an apple, into two equal parts, and by placing them on a table, or any flat surface, with their edges in contact. Having formed a correct and clear idea of the map of the world, they will easily conceive that the map of Europe, Ireland, or of any particular country, is intended to represent a portion cut, as it were, out of the general map of the world.[a] A small wooden globe, divided into two equal parts will give children correct ideas, both of the form of the earth, and of the two hemispheres, or map of the world. When the teacher is explaining the form of the *earth*, he should hold the small globe in his hand; and when, the *two hemispheres* into which it is supposed to be divided, he should take it asunder, and place the *two half globes* against the wall, with their edges in contact, and in *juxta-position with a map of the world.*[b]

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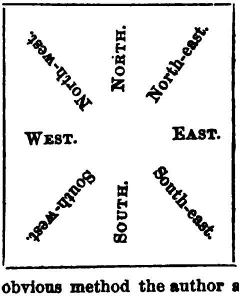
[a] In using a map for the first time, it should be laid upon the floor or upon a table, with the *top* in the direction of the *north* side of the school-room. In this way the learner will get a clear idea of what the map is intended to convey. It is only for convenience that a map is hung up against a wall; and when it is in this position, it should be kept in mind that the *north* side of it is not towards the *north*, but in the direction of the *zenith*.

But before the pupils are introduced to a map, they should be quite familiar with the principal points of the horizon as recommended, page 149. In a map these points may be represented thus:—



[b] This simple and obvious method the author afterwards improved upon. It struck him that the ordinary small globes used in schools might be divided in the same way; and Messrs. Malby and Son have succeeded in carrying out his idea in a manner worthy of their name. The small globes so divided by the Messrs. Malby are called SEMI-GLOBES; and the author strongly recommends their use to every person who undertakes to teach geography to children. In fact, in every school in which there is a map of the world, a small globe so divided should be placed beside it.

Latitude, *Longitude*, *meridians*, *parallels*, and *zones*, which, to children, appear as so many mysteries, may be simply and clearly taught by the use of such a globe. The *tropics*, *polar*, and other circles may be easily added and explained; and if the globe be painted black, it will be easy to give an outline in chalk of the relative position and extent of the great division of the earth's surface into continents and oceans. For example, ask the pupil to point to the spot where England should be, and *if he recollects* its latitude and longitude, he will at once determine its proper position. He will say, that as it lies between the parallels of 50° and 56° north latitude, it is more than half-way between the equator and north pole; and, of course, under the *first meridian*, which passes through the east of it. The position of Ireland and Scotland—the one to the *west*, the other to the *north*, of England, and forming a portion of it—may then be pointed to, or dotted in chalk; and so of other countries. In short, such a globe has, besides its *peculiar* advantages, all the utility of a *blank* or *outline map*.

The cause of day and night, and the changes of the seasons, may also be simply and clearly explained by means of two little wooden globes, such as are used in this establishment. For explaining the seasons we use a simple contrivance, which shows, at one view, the different positions of the earth with regard to the sun during the summer and winter *solstices*, and also the *equinoxes*. It consists of four small balls, painted and fixed, as represented in the diagram, page 21, and a larger ball in the centre (where the candle is supposed to be), which represents the sun. The central ball stands upon a frame like a candlestick (upon the top of which it may be made to turn as on a pivot), and supports the other by four straight wires, which issue from its centre at right angles to each other. These wires enter the small globes at the *equinoctial* and *solsticial* points; and as they represent the perpendicular rays of light from the sun at those seasons, they form the centre of the *circle of illumination;* which is represented by painting the half of each of the small globes, from this point, *white*.

The different phases of the moon may also be familiarly explained by means of small globes similarly painted; and the planetary system generally. This we do; and it is found a much easier, and, therefore, a much better way of explaining them, than by means of an orrery, which is not only a complicated, but an incorrect[a] represen-

[a] "Choose any well-levelled field or bowling-green; on it place a globe two feet in diameter; this will represent the sun; Mercury will be represented by a grain of mustard-seed on the circumference of a circle, 164 feet in diameter, for its orbit; Venus, a pea, on a circle of 284 feet in diameter; the earth, also a pea, on a circle of 430 feet; Mars, a rather large pin's head, on a circle of 654 feet; Vesta, Juno, Ceres, Pallas, grains of sand, in orbits of from 1,000 to 1,200 feet; Jupiter, a moderately-sized orange, in a circle nearly half a mile across; Saturn,

tation of the motions, magnitudes, and distances of the heavenly bodies. The simpler the contrivance, the better for illustration, and the nearer the resemblance to the simple but sublime machinery of nature—to the works of that Great Being, who

> "Bids seed time, harvest, equal course maintain,
> Through reconciled extremes of drought and rain;
> Builds life on death, on change duration founds;
> And makes the eternal wheels to know their rounds."

Having taught the pupils as much of *Mathematical* Geography, it will enable them to comprehend the figure, magnitude, and motions of the earth, their attention is directed to the great divisions into which its surface is naturally divided; or, in other words, they are introduced to *Physical* Geography.

We begin by giving them general views and leading ideas. Having made them observe that there is far more *water* than *land* upon the surface of the globe, we inform them that the proportion is probably as 7 to 2, or, in other words, that nearly three-fourths of the earth's surface are covered with water.

We then inform them that the entire surface of the globe, land and water included, is supposed to contain about 197 millions of English square miles;[a] and they will draw the conclusion, that that portion of it which consists of land is only 51½ millions. They are then told that these 51½ millions of square miles are distributed among the five great divisions of land into which the earth's surface is divided; and having pointed them out to them on a map of the world, they are asked to give their opinion as to the *relative* extent of each. This they will readily do; and their answers will, generally speaking, be found to correspond very nearly with the estimated extent, as *given in books*. For example, if they are asked how much *Asia*, as it appears on the map, is larger than *Europe*, they will very probably reply that it is about *five* times as large; and with regard to the other great divisions, and the principal subdivisions of them, similar questions are put, and similar answers elicited. And after they have gone through these preliminary exercises, the next step is to make them acquainted with the estimated extent of each of the great divisions of the earth's surface, and also the estimated extent of each of the principal or most important countries which they contain.

These proportions are not only pleasing to the pupils, but are calculated to give them clear ideas of the comparative extent of land

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a small orange, on a circle of four-fifths of a mile; and Uranus, a full-sized cherry, or small plum, upon the circumference of a circle more than a mile and a half in diameter. As to getting correct notions on this subject by drawing circles on paper, or still worse, from those very childish toys called orreries, it is out of the question."—*Sir J. Herschel's Astronomy.*

[a] The superficies of a globe is found by multiplying the circumference by the diameter (accurately by $3\frac{1}{7}$.)

and water on the earth's surface; and of the real and relative size of each of the great continents, and of the principal countries into which they are divided.[a]

They are next told the estimated amount of the POPULATION[b] of the world, and of each of the great divisions into which it is divided; and they will soon make the discovery that Asia contains about *one-half* of the population of the world; Europe about *one-fourth*; and so on. And before going farther they are made acquainted with the difference between the *absolute* and *relative* population of a continent or country. They are asked, for instance, whether Asia or Europe is the more *populous*; and as their answer would probably be *Asia*,

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[a] The extent of each of the great divisions of land in millions of square miles is estimated as follows: Europe, with its islands, 3,700,000; Asia, with its islands, 17,500,000; Africa, with Madagascar, 11,700,000; America, with its islands, 15,000,000; Oceanica, or Australia and Polynesia, 3,500,000.

[b] The amount of the population of the world has been variously estimated; and it is obvious that all calculations on this subject are little more than conjectures. It is only with regard to Europe, and perhaps America, that they should be considered as approximating to the truth.

Balbi estimated the amount of the population of the globe at 737 millions, and Malte Brun at only 625 millions; but the amount is now estimated at from 1,000 to 1,200 millions. The following estimates are from the best and most recent authorities:—

	Population.	No. of persons to a square mile.	Acres to each person.
Asia, . .	650,000,000	38	17
Europe, . .	270,000,000	71	9
Africa, . .	100,000,000	9	71
America, . .	60,000,000	4	165
Oceanica, . .	30,000,000	7	96
Total, .	111,000,000	Average, 21	30

In connexion with the amount of the population of the world, the following particulars regarding the duration of HUMAN LIFE may be stated:—

One-fifth of all who are born die within a year after birth.
One-third „ „ before the completion of fifth year.
One-half „ „ before the age of seventeen.
Only six per cent. reach the age of 75 years.
Only one in 500 „ „ 80 „
Only one in 1,000 „ „ 100 „
The average duration of human life is about thirty years.

they are shown that this is really not so. For upon dividing the amount of the population in each by the number of square miles which they contain, it will be seen that in Europe there are about 71 persons to the square mile; and in Asia only about 38. Similar information is subsequently given; and similar questions asked about the population of the principal countries in the world.

The great *physical* features and natural boundaries of the several continents are next pointed out. For instance, South America is, generally speaking, divided by mountains and rivers into five great divisions—namely, the western declivity between the Andes and Pacific Ocean; the basin of the Orinoco; the basin of the Amazon; the basin of the Paraguay; and Patagonia or the southern extremity. In like manner, North America is divided into five great natural divisions—namely, the basin of the Mississippi; the western de-declivity between the Rocky Mountains and the Pacific Ocean; the northern declivity between the Great Lakes and the Arctic Ocean; the eastern declivity, between the Alleghany Mountains and the Atlantic; and the basin of the St. Lawrence.

Again, Europe may be traversed from S.W. to N.E. without crossing any considerable river. Europe is, therefore, divided by mountains and elevated regions into two grand declivities, namely, the north-western and the south-eastern; and the great rivers, generally speaking, will consequently flow in a N.W. or S.E. direction. The Volga, the Dnieper, the Don, the Danube, &c., flow in the latter, and the Rhine, the Elbe, the Vistula, the Oder, &c., in the former direction. Of course there are other declivities, and consequently rivers in other directions, but we are taking a general view.

The physical features and natural divisions of Asia are peculiarly grand and striking. In the centre is the great table-land or elevated regions between the Altai Mountains on the north, and the stupendous range of the Himalayas on the south. Between this elevated region and the Arctic Ocean, is the great *northern* declivity, which extends from the Uralian Mountains on the west, to the rocky shores of the Pacific on the east.

The great *southern* or *south-western* declivity of Asia comprehends all the countries southward of the Himalaya Mountains, the Caucasian, and the intermediate chains—that is, generally speaking, the Eastern and Western Peninsula, Persia, Arabia, and Syria.

The great *eastern* declivity comprehends China, Corea, and the eastern part of Chinese Tartary. The *western* declivity, which is much less extensive than the others, lies to the west of the Beloor Tag, and the chain of mountains which connects the Himalaya with the Altaian ranges. These grand natural divisions may be traced by the great mountain ranges which separate them, and the immense rivers which flow through them. For instance, the *northern* declivity is shown by the course of the Lena, the Yenessei, and the Obi; the *eastern*, by the Amoor, the Hoang-ho, and the Yang-tse-kiang;

and the *southern*, by the Euphrates, Tigris, Indus, Ganges, Irrawaddy, and Cambodia; and the *western*, by the Syr or Sihon (Jaxartes), and the Amoo or Jihon (Oxus).

A knowledge of the great mountain ranges is of far greater utility to pupils in geography than is generally thought. Upon their height, direction, and distance from the sea, depend, generally speaking, the magnitude and directions of the rivers. If near the sea, the rivers which flow from them are short, rapid, and ill-adapted for navigation. Such rivers we may expect to find between the Andes and the Pacific Ocean. If at a great distance from the sea, the rivers which flow from them, will be long, gentle, and navigable. Upon such rivers man takes up his abode—towns are built—commerce commences—and civilization follows in its train.

When the pupils are made acquainted with the general outlines and natural divisions of the earth's surface, we proceed to *Political Geography*. In this branch of geography, also, we begin by giving general views and leading ideas; and having traced the great outlines, we fill them up gradually, and in every thing that concerns Great Britain and Ireland, as minutely as practicable. At every step we apply the principles of CLASSIFICATION and COMPARISON.[a] Mountains, rivers, lakes, states, cities, &c., are *classed* and *compared*; which not only assists the memory of the pupils, but enables them to form correct conceptions of the real and relative magnitude of each. They are told, for instance, the height of a mountain, or the length of a river, with which they are are familiar—or the population of the town in which they reside, and from these points the *classifications* and *comparisons* commence. The pupils are thus enabled to form correct and clear ideas of things which they do not know, by comparing them with things with which they are familiar. The largest river in Ireland is the Shannon—the largest in Europe the Danube (for the Volga is rather an Asiatic river); the length of the former is little more than 200 miles, of the latter about 1,800. It would take nine such rivers, therefore, as the Shannon, to make the Danube. Again, the highest mountains in Ireland are the Reeks in Kerry—in Europe, the Alps; the highest of the former (*Carn Tual*) is 3,410 feet above the level of the sea; of the latter (*Mont Blanc*), 15,744. The Alps are, therefore, nearly five times as high as the highest mountains in Ireland. Or, four such mountains as Carn Tual, piled on the top of each other, would not equal Mont Blanc in height and magnitude. What an idea this gives to children of the surpassing grandeur of Mount Blanc. And how their conceptions are enlarged, when informed that there are mountains in America and Asia nearly twice as high!

INTRODUCTION TO ASTRONOMY.

TEACHERS should prepare their pupils for the study of ASTRONOMY by directing their attention to the apparent motions and relative positions of the heavenly bodies. For this purpose let them be conducted to some place in their neighbourhood which commands an uninterrupted view of the horizon. Looking around them, they will observe that they appear to be in the middle of an immense circle, the circumference of which is formed by the apparent meeting of the earth and sky. The circumference of this imaginary circle, it may be observed, is called the HORIZON, because it *bounds* or limits the view of the observer.

They will observe also that the heavens present the appearance of a vast concave hemisphere, every part of which seems equally distant from them; or, in other words, in the centre of which they appear to stand.

During the day the magnificent dome of the heavens is lighted up by the sun, which, after rising above the eastern horizon, and traversing the sky in a circular course, disappears in the west. When the sun sinks beneath our horizon, the stars, which seem to be scattered in thousands over the vault of heaven, begin to make their appearance; and the moon, at her appointed time, hangs out her silvery lamp, as if in aid of their too distant light.

On the following morning the sun re-appears in the east, and after going over the same course as on the preceding day, he disappears again in the west. The daily repetition of this magnificent phenomenon has made it so familiar to our eyes, that we, perhaps, cease to regard it with wonder and admiration; but to the young and inquiring mind such questions naturally suggest themselves—is it the same brilliant body that traverses the heavens day after day, dispensing light and heat to the earth which we inhabit? Or is

there a new sun every day? If it is the same sun as it appears to be, what becomes of it during the night? Or how is it that, after disappearing from our view in the evening, in the west, it re-appears the following morning in the opposite point of the heavens? Does it continue its *circular* course *under* the earth during the night, and thus, *by completing the circle*, return to the point from which it set out in the morning? If so, the earth is not, as it appears to be, a vast plain or flat surface extending to the heavens. It must be separate or *detached* from the heavens (at least on the eastern and western sides), otherwise the sun and the stars—for it will be found that they have a similar motion—could not revolve round it in this way.

Such observations and such inferences young and inquiring minds will naturally make; and it will be the part of the instructor to lead his pupils to make such observations, and to assist them in coming to correct conclusions.[a] It was in this way that astronomy was originally studied, long before globes were invented or books written, and it is in this way the first and great principles of the science should still be taught. Let the teacher, therefore, conduct his pupils step by step over the ground which the first discoverers trod; and the difficulties of astronomy, which to young and uninstructed minds seem so numerous and so formidable, will gradually disappear—nay more, these very difficulties will be converted into subjects of admiration and delight.

Let us now take a view of the starry heavens. The stars appear to be innumerable, and they are so in reality, though to the naked eye there are scarcely ever so many as two thousand visible, even in the brightest nights. At first view they appear to be fixed in the heavens, but if after short intervals we repeat our observations, we shall find that, like the sun, they have a regular motion from east to west. For if, having observed any particular star to be in a line with our eye, or some lofty object, such as a tree or the top of a chimney, we repeat our observation in, say an hour after,

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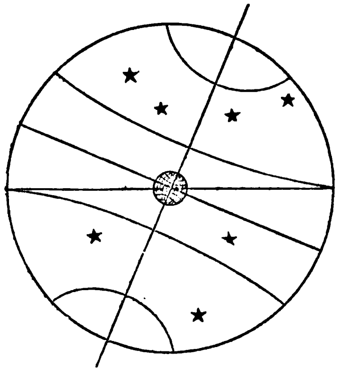
[a] For example, having of themselves come to the conclusion that the earth must be detached from the heavens on the *east* and *west* sides, they may be led to infer by *analogy* that it is detached from the heavens on every side, or all round the horizon. The importance of this fact is obvious; for if the earth is detached from the heavens on every side, it must be self-supported. See page 13.

we shall find that this star, and the others which we may have noticed in the vicinity of it, have moved a considerable space to the westward. The stars, too, which we observe near the western horizon will in a short time disappear beneath it; whilst others, not now visible, will soon make their appearance in the east. But while the stars in general appear, like the sun, to rise in the east and set in the west, there are others which appear to revolve round a fixed point in the heavens, without ever reaching so far as our horizon. This point is called the POLE of the heavens, because the whole celestial sphere appears to *turn* round it as on a pivot, from east to west, in twenty-four hours, carrying with it in the same direction, and in the same time, the sun, moon, and stars.

The apparent diurnal motion of the heavens may be illustrated in the following simple manner:—Through a small glass globe, such as those out of which watch glasses are cut, pass a knitting-needle from the circular aperture at the bottom[a] to the point opposite, and make the globe turn round upon it as upon an axis. The globe will represent the celestial sphere, and the knitting-needle the axis on which it is



[a] The circular aperture at the shank or pipe through which the globe was blown.

supposed to turn. Before introducing the imaginary axis, affix to its middle point a small ball about the size of a marble to represent the earth in the centre of the celestial sphere. The points of the globe at which the needle, or, as we shall now call it, the axis, enters and terminates, will represent the poles of the heavens; and to complete the illustration, the sun and a few of the principal stars may be represented by bright specks of paint or gold leaf on the convex or outer surface of the globe.

Now let the teacher, having inclined the upper or north pole of the glass globe in the direction of the pole star, make it turn round upon its axis from east to west, and his pupils will have a clear and correct representation of the apparent motions of the heavenly bodies—that is, if they conceive themselves to be on a fixed point on the surface of the small globe in the centre, which represents the earth.

To aid their conception, a circle should be drawn round the glass globe to represent the celestial equator, and another and corresponding one round the small globe in the centre to represent the terrestrial equator. A meridian circle or two should also be drawn on each of the globes.

Now, from the point on which we conceive ourselves to be placed, it will be easy to conceive that only one-half of the concave surface of the outer globe can be seen, as in the case of the visible heavens. The circle which divides the *visible* half of the sphere from the half which is *invisible*, is called the RATIONAL HORIZON; and the highest point of the visible hemisphere, or the point directly over the head of the observer, is called the ZENITH. The zenith is evidently a *quarter* of a circle, or 90 degrees, distant from every point of the horizon; and if we conceive a straight line drawn from the zenith through the earth, in the direction of our feet, it would point to the NADIR, or the lowest point of the invisible hemisphere of the heavens.

The relations which exist between the circles supposed to be drawn on the terrestrial and celestial spheres should also be pointed out. The equator of the earth, if extended to the heavens, would coincide with the celestial equator; and the same may be said of the corresponding meridians. Between the terrestrial and celestial tropics, polar, and the other corresponding parallel circles, similar relations exist; and it is evident from the ILLUSTRATION in our hands, that

the axis of the heavens is a continuation of the axis of the earth.

It may now be shown that the horizon, and consequently the aspect of the heavens, varies with the position of the observer. If we were at the north pole of the earth, for instance, it is evident that the polar star, or north pole of the heavens, would be in our zenith,[a] and that our rational horizon would coincide with the celestial equator. In such a position all the northern celestial hemisphere would be visible to us, and all the heavenly bodies situated in it would appear to move round and round in circles parallel to the horizon. Those that are in the equator will sweep the horizon, and those that are near the pole star will make small circles round it; while the stars in the southern hemisphere will remain constantly invisible to us. This is called the PARALLEL position of the sphere. Now let us suppose ourselves transported to the equator, and it is evident that the celestial equator would be in our zenith, and the poles of the heavens in our rational horizon. In such a position, the stars would appear to us to rise and set at right angles to the horizon; and as the half of each of the diurnal circles which they describe is *above*, and the other half *below* the horizon, it follows that they must be visible and invisible alternately for *half* the time of their diurnal rotation, that is, for twelve hours. Those that rise in the east point of the horizon will, after traversing the heavens in a semicircle passing through the zenith,[b] set in the west; while those that rise between the east and the south points of the horizon, or between the east and the north, will, after describing regular semicircles, set in the corresponding points of the horizon in the opposite side of the heavens.

This is called a RIGHT position of the sphere, because the equator, and all the circles parallel to it, cut the horizon at *right* angles.

Now let us in supposition move *northward* from the equator, and it is easy to conceive that the polar star, or north pole of the heavens, will appear to rise above the northern point of the horizon in proportion to the space passed over;

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[a] Accurately speaking, the polar star is 1° 20′ from the pole of the heavens; it is, therefore, never exactly over the pole of the earth.

[b] Like the sun during the equinoxes to persons at the equator.

and that the south pole of the heavens will sink beneath the southern point of the horizon in the same proportion. If, for instance, we travel ten degrees *north* from the equator, the pole star will appear to us to be elevated the same number of degrees above the northern point of the horizon, while the south pole of the heavens will be depressed beneath the southern point of the horizon in the same proportion; and if we travel a like distance *south* of the equator, it is easy to conceive that the reverse of this would take place. (See pages 10 and 44.)

To us, for instance, who are situated about 53½° north of the equator (Dublin), the altitude of the polar star above the north point of the horizon is precisely the same number of degrees, that is, 53½°; and from what has been said, it is easy to conceive that the south pole of the heavens is depressed beneath the south point of the horizon in the same proportion, that is, 53½°. To us, and to all persons situated between the equator and the poles, the heavenly bodies appear to move in circles more or less inclined to the horizon; or, in other words, when one pole of the heavens is elevated above, and the other depressed below the horizon, the equator and all the circles parallel to it make *oblique* angles with the horizon. This is called an OBLIQUE position of the sphere.

From what has been said, it will be easy to conceive that to persons in our latitude those stars that are within 53½° of the pole star will be constantly visible, except when obscured by the light of the sun or the vapours of the atmosphere. Those that are just 53½° from the pole star will, once in the course of their diurnal revolution, just touch the verge of the horizon; while those that are at a greater distance from it, will describe less or more of their diurnal circles below the horizon. In illustration of this, the teacher should point out to his pupils the most conspicuous of the *circumpolar* stars, that is, those stars which in performing their apparent diurnal revolutions about the pole, never reach so far as our horizon. The constellations of the Great Bear and Cassiopeia, which are on opposite sides of the pole star, and at about equal distances from it, will furnish the teacher with interesting examples.

The seven bright stars in the Great Bear, which are commonly called the Plough, and sometimes Charles' Wain, should be particularly noted. The two outside stars in the

square of the Plough are called the POINTERS, because they, in every position, *point* to the polar star; that is, a line carried from *Merak*, the lower, through *Dubhé*, the upper star, for 29°, or *about five times the distance between them*, will bring the eye of the observer to the polar star.

To the mariners of old these constellations were of essential importance. The polar star, in particular, was their great guide, when leaving sight of land they ventured to embark upon unknown seas. The magnetic compass has enabled the mariners of the present day to steer their course over the pathless ocean with unerring certainty, even in the darkest night; and astronomical science has furnished them with other means of determining their position on the earth's surface; yet the polar star may still be regarded as the great celestial compass of the northern half of the world. (See p. 46).

When the teacher has fully explained to his pupils the relations which exist between the celestial and the terrestrial spheres, and illustrated the apparent motions of the heavenly bodies in the manner recommended, he should gradually introduce them to a knowledge of the facts and arguments which led to the discovery of the true system of the universe. The proofs of the diurnal motion of the earth are briefly stated in the Second Chapter of this work, to which the teacher should refer. These proofs the ILLUSTRATION in his hands will enable him to explain fully, and elucidate clearly.

For example, let him make the small globe in the centre, which represents the earth, turn round upon the needle or axis from *west* to east, while the outer or glass globe remains stationary, and his pupils will have little difficulty in comprehending how the apparent motion of the heavenly bodies from *east* to west, is produced by the real motion of the earth round its axis in the contrary direction. For, let them imagine themselves placed on that point of the inner globe which corresponds to their present position on the earth, and it will be easy to conceive that, while they turn round from *west* to east unconscious of their motion, the outer or glass globe which represents the heavens will *appear* to revolve round them in the contrary direction, that is, from *east* to west. When the eastern verge of their horizon approaches that part of the heavens in which the sun is situated, the day will begin to *dawn;* when their

meridian comes opposite the sun, it will be *mid-day;* and when, by the continued motion of the earth round its axis to the eastward, the sun disappears beneath the western horizon, the day will be completed. Night will then commence, and the stars in like manner will appear to revolve round them till, by the rotation of the earth, that part of the heavens in which the sun is situated again appears above their eastern horizon.

In using this ILLUSTRATION we have supposed that the earth is in the centre of the celestial sphere, and that it always remains in the same position in space. Neither of these suppositions is, in point of fact, true, yet as far as the ILLUSTRATION and the *arguments* are concerned, they are both sufficiently accurate. For so immense—we might say, so *infinite*—are the dimensions of the visible sphere of the heavens, that an observer at any point within it would imagine himself to be in the centre. If we travel to the uttermost parts of the earth we would, as we do now, imagine ourselves to be in the centre of it; and if we could transport ourselves through the immensity of space to the most distant star, our position with regard to it would appear unaltered, that is, we would still imagine ourselves to be in the centre of the sphere of the heavens!

The earth, therefore, appears to be in the centre of the visible sphere of the heavens; and though it describes every year, in its motion round the sun, a circle nearly 200 millions of miles in diameter, its position with regard to the heavens appears to remain unaltered; that is, the earth in every part of its orbit appears to be in the centre of the celestial sphere.

This amazing and almost inconceivable fact has been illustrated in a preceding part of this work,[a] to which the reader is referred; and in the same chapter will be found a description of the earth's ANNUAL MOTION round the sun, with PROOFS and ILLUSTRATIONS.

We shall now give a brief description of the system of the universe.

The celestial sphere appears to *turn* round from *east* to west every 24 hours, carrying with it in the same time, and in the same direction, the sun, moon, and stars. Hence the

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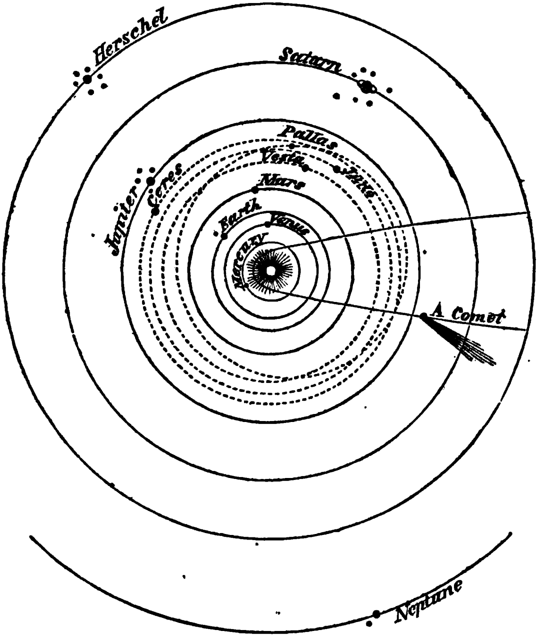
[a] See page 24 for the illustration referred to.

term UNIVERSE[a] has been applied to the *whole* system of the heavens and heavenly bodies; or, in other words, to the whole range of creation.

That portion of the universe of which the sun is the centre, is called the SOLAR system. This system consists of the sun, the stars called PLANETS, with their SECONDARIES OF SATELLITES, and a certain number of COMETS.

SOLAR SYSTEM.



The planets, though they differ very little in appearance from the stars, are opaque bodies like the earth—and in fact,

[a] *Universe.*—So called because the heavens and heavenly bodies appear to *turn* round in *one* and the same time.

the earth is a planet. The light with which they shine is not their own, but received from the sun and reflected back, as in the case of the moon. Like the earth, they revolve round the sun from west to east in orbits nearly circular. Like the earth, too, the planets, while revolving round the sun, turn upon their axis from west to east; and thus, like it, they have their days and their nights, their seasons and their years.

The names of the PRIMARY planets are (in the order of their distances from the sun)—Mercury,[a] Venus, the Earth, Mars, the Asteroids, Jupiter, Saturn, Herschel, or the Georgium Sidus, and Neptune. Five of these planets, namely—Mercury, Venus, Mars, Jupiter, and Saturn are visible to the naked eye, and were known to the ancients. Herschel, the Asteroids, and Neptune have been discovered in modern times by the aid of the telescope; and there may be others yet undiscovered.[a]

The SECONDARY planets, or satellites, revolve round their primaries as their centres, and with them round the sun. The number of secondary planets as yet discovered is twenty; namely—the MOON, which belongs to the earth, the *four* SATELLITES of Jupiter, *eight* of Saturn, *six* of Herschel, and *two* of Neptune. Except the moon, none of the secondary planets are visible to the naked eye.

The description we have given of the FORM and MOTIONS of the EARTH in a preceding part of this work, is applicable to every planet in the system. They are all *spherical* bodies like the earth; and like it, they are carried round in their orbits by the counteracting forces of projection and gravitation.

What a gratifying announcement this must be to the pupils who have made themselves acquainted with the causes which account for the SPHERICITY and MOTIONS of the earth! Without any additional effort on their part—without even having formed any such expectation, they find themselves all at once, and as if by intuition, acquainted with the forms and motions of all the planets and all the satellites! Nay, the same principles, it may be presumed, operate beyond our system—"Where other planets circle other suns;" for there is every reason to conclude that every star in the universe,

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[a] It has just been announced that a French physician has discovered a planet between Mercury and the Sun. It has been named *Vulcan*.

and their number is beyond all human computation, is the sun and centre of a planetary system!

The following table exhibits at one view the DIAMETERS of the several planets; their DISTANCES from the sun; the lengths of their DAYS and YEARS as measured by the time of their rotation upon their axes, and their periodic revolutions round the sun.

TABULAR VIEW OF THE SOLAR SYSTEM.

Names.	Diameter in miles.	Mean distance from the sun.	Time of rotation on axis.				Period of revolution round the sun.			
			D.	H.	M.	S.	D.	H.	M.	S.
Sun,	887,076	—	25	7	48	0	—			
Mercury,	2,950	36,890,000		24	5	28	87	23	15	43
Venus,	7,900	68,770,000		23	21	7	224	16	49	8
Earth,	7,912	95,298,260		23	56	4	365	6	9	10
Moon,	2,160	95,298,260	27	7	43	4	365	6	9	10
Mars,	4,500	145,205,000	1	0	37	20	686	23	30	41
Asteroids,[a]	—	—		—			—			
Jupiter,	88,780	495,817,000		9	55	29	4,332	14	27	11
Saturn,	77,230	909,028,000		10	16	0	10,759	1	51	11
Herschel,	35,000	1,828,070,000		—			30,686	0	0	0
Neptune,	31,000	2,862,457,000		—			60,126	17	0	0

OBSERVATIONS UPON THE PLANETARY SYSTEM.

PLANETS.—The stars called *planets*[b] were so denominated because they appear as if *wandering* through the heavens. At one time they are seen to move from *west* to east; at another, in the contrary direction—that is, from *east* to west; and at other times they appear to stand still, as if uncertain which way to move.

> Their *wandering* course, now high, now low, then hid;
> Progressive, retrograde, or standing still. MILTON.

These motions appeared to the ancients intricate and mysterious, because they were ignorant of the *true* system of the heavens; but to us, who are acquainted with it, they appear simple and natural. In fact, as we observed before, the motions of the planets are in all respects like the motions of the earth. Like it, they move in their

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[a] The *diameters* of only a few of the ASTEROIDS are known; and none of them exceed a few hundred miles in length. And with regard to their *distance* from the sun, they are all farther than Mars and nearer than Jupiter. See *Asteroids*, p. 169.

[b] *Planets*, from the Greek πλανηται, *wanderers*.

orbits from west to east, by south, round the sun; and like it they turn upon their axes in the same direction—that is, from west to east.

If we were in the middle of a *circular* race-course, the horses would appear to move regularly round and round us; but if we were at the distance of two or three miles from such a course, the motions of the horses would no longer appear regular. For suppose the course were in a southern direction from us, and that the horses started at the side of it farthest from us, with their heads towards the east, it will be evident that, though galloping regularly round the course as before, their motions would appear to us to be irregular—and, if we are ignorant of the cause, inexplicable. While describing the off-side of the course they will appear to us to move from *west* to east; while rounding it in the direction of the place in which we are supposed to stand—that is, while *approaching us in a straight line*, they will appear to be without motion; while galloping round the side nearest to us, they will appear to move from *east* to west—that is, in the contrary direction from which they set out; and finally, they will appear again to be stationary while moving round from us in a straight line.

Now let us apply this to the planetary system. If we could view the planets from the centre of the system—that is, from the sun, they would all, including the earth, appear to move regularly round and round us, in orbits proportioned to their respective distances from the sun; but as we view them from the earth, which is *not* in the centre, their motions must necessarily appear irregular. At one time their motions will appear to be from *west* to east—that is, *direct*;[a] at another, from *east* to west, or *retrograde*; and at other times they will appear to be without motion, or *stationary*—just as the motion of the horses in a *circular* race-course would appear if viewed from *without*, at the distance of two or three miles.

NAMES OF THE PLANETS.—We have seen, page 28, that the nearer the earth is to the sun, the greater is its velocity in its orbit; and the same principles apply to all the planets. Hence we may conclude that the nearer a planet is to the sun, the greater is its velocity in its orbit. MERCURY, therefore, travels quicker in his orbit than any of the other planets, and from this circumstance he appears to have derived his name. For in the heathen mythology, *Mercury* was the messenger of the gods; and *speed* is an essential quality in a messenger.

VENUS approaches much nearer to the earth than any of the other planets, and hence she appears to us the largest, the brightest, and the most *beautiful* of them all. From this circumstance she derives her name.

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[a] *Direct* motion. That is, in the order of the Signs. See p. 27.

Mercury and Venus are called *inferior* planets, because their orbits are *within* the earth's orbit: that is, between it and the sun. The other planets are called *superior*, because their orbits are *without* or beyond the orbit of the earth. (*Interior* and *exterior* would be more appropriate terms.)

When viewed through a telescope, Mercury and Venus present phases similar to those of the moon; from which it follows that they do not shine with their own light, and also that the orbits in which they revolve are between the earth and the sun. When Mercury or Venus is in a line between the earth and the sun, a TRANSIT takes place. On such occasions the planet appears to cross the sun's disk like a dark spot. If the planes of the orbits of Mercury and Venus lay exactly in the plane of the earth's orbit, transits would take place at every *inferior* conjunction. But, like the moon, they pass, except on rare occasions (particularly Venus), either a little above or a little below the sun.—See page 27. The transits of Venus (by which the distance of the earth from the sun is determined) can occur only twice in a century, because it is only twice in that time that any number of complete revolutions of Venus are just or nearly equal to a certain number of the earth's revolutions. The next transit of Venus will occur in 1874.

When Venus rises before the sun, which she does when she is to the west of him, she is called *Lucifer*, or the *Morning Star;* and when she is east of the sun, and consequently sets after him, she is called *Hesperus*, or the *Evening Star*. If Venus could be seen by us when she is in *inferior* conjunction, she would appear like a brilliant moon, but when she is in that position with regard to the earth, her darkened hemisphere is next us.

MARS is distinguished from the other planets by his red, fiery appearance; and hence, it is probable, the ancients bestowed upon this planet the name of the god of war. The colour of Mars is occasioned by the great density of his atmosphere, through which only the strong *red* rays of light are able to penetrate. The colour of the sun during a fog, or when near the horizon, where the atmosphere is densest, is an illustration of this.

ASTEROIDS.—The small planets Ceres, Pallas, Juno, and Vesta, were discovered in the beginning of the present century; and because they differ in some respects from the other planets, they were called *Asteroids*.[a] Since the year 1845, no fewer than *fifty-two*[b] similar planets have been discovered in the same region of the heavens, that

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[a] ASTEROIDS, that is, *like* or resembling *stars*. Compare the term Spheroid, note [a], page 8.

[b] Their names are: Iris, Flora, Metis, Hygeia, Parthenope, Victoria, Egeria, Irene, Eunomia, Psyche, Thetis, Melpomene, Fortuna, Marsalia, Lutetia, Calliope, Thalia, Themis, Phocea, Proserpine, Euterpe, Bellona, Amphitrite, Urania, Euphrosyne, Pomona, Polyhymnia, Circe, Leucothea, Fides, Atalanta, Leda, Lætitia, Harmonia, Daphne, Isis, Ariadne, Nysa, Eugenia, Hestia, Aglaia, Doris, Pales, Virginia, Nemausa, Europa, Calypso, Alexandra, Pandora, and one (discovered on 9th September, 1857,) not yet named.

is, between the orbits of Mars and Jupiter, and they are now usually called "The Minor or Ultra-zodiacal Planets."

More than 300 years ago, Kepler, the great German astronomer, predicted that a planet would be found between the orbits of Mars and Jupiter; and when the *Asteroids* were first discovered, it was supposed that they were the fragments of the planet alluded to, which, at some remote period, had burst in consequence of some internal convulsion.[a]

JUPITER is the *largest* of all the planets, and hence the ancients gave him the name of the father of the gods. Though so far from the earth and sun, he appears to us nearly as large, and almost as brilliant, as Venus.

Particularly when he is seen in that part of his orbit which is nearest to the earth. When viewed through a telescope, he is found to be attended by four SATELLITES or moons, which exhibit, on a small scale, and in short periods, most of the *phenomena* of the solar system. And as they pass through his shadow, as the moon does through the earth's, they are frequently and regularly undergoing eclipses. For the most part, two of them are above his horizon at the same time; and so rapidly do they change their appearance—particularly the first or nearest, that in the short space of 42 hours, it presents all the *phases* of the moon, from the thin crescent to the full orb, undergoing an eclipse itself, and causing an eclipse at the surface of Jupiter within the same period. This satellite, as seen from Jupiter, appears four times as large as our moon. The next, or second satellite, completes its revolution in about $3\frac{1}{2}$ days, or *half* a week; the third, in about *a week*; and the fourth, or farthest, in something more than *two weeks*.

By means of the eclipses of Jupiter's satellites it was discovered that the motion of light is progressive, and not instantaneous, as was formerly supposed. It was observed, for instance, that an eclipse of any of these satellites is seen 16 minutes sooner when Jupiter is at his least distance from the earth than when he is at his greatest; from which it follows, that it takes light 16 minutes to travel over the diameter of the earth's orbit, that is 190 millions of miles. The rays of light, therefore, issuing from the sun, reach the earth in about 8 minutes; that is, light travels at the rate of about 12 millions of miles in a minute—a velocity more than a million of times greater than that of a ball issuing from the mouth of a cannon!

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[a] This was the opinion of Olbers, and of several other eminent astronomers; but, of course, it is mere conjecture. On this subject Mr. Hind has observed, "It is singular that this group (the Asteroids) appears to separate the planets of small mass from the greater bodies of the system, the planets which rotate on their axes in about the same time as the earth, from those which are whirled round in less than half that interval, though of ten times the diameter of our globe; and it may yet be found that these small bodies, so far from being portions of the wreck of a great planet, were created in their present state for some wise purpose, which the progress of astronomy in future ages may eventually unfold."

The eclipses of Jupiter's satellites have also furnished navigators with a method for determining their longitude.—See page 50.

Jupiter is also distinguished for his BELTS, which, when viewed through a telescope, appear like bands or zones parallel to each other, and in general, to his equator. Some of them are dark, and others luminous; and as they frequently change their number and appearance they are supposed to be clouds formed into strata by trade winds blowing round his equatorial regions; the dark bands being clouds, and the luminous ones the body of the planet seen between them.

SATURN, according to the heathen mythology, was the father of Jupiter, and hence his name was given to this planet, because it was supposed to be the farthest out in the system. For a similar reason the Continental astronomers call Herschel, or the Georgium Sidus, by the name of the oldest heathen deity, URANUS; Saturn being fabled to be the son of *Uranus* and Terra—that is, of the *heavens* and the earth.

Saturn, when viewed through a telescope, is found to be attended by eight satellites or moons. But what particularly distinguishes this planet is the magnificent RING of light which encircles it. This ring is more brilliant than the planet itself: and when examined attentively, it is found to be divided into two distinct parts by a dark band, so that there are at least two rings, and probably more. These rings lie in the plane of Saturn's equator, and are probably of great use in reflecting the light of the sun to this distant planet.

NEPTUNE.—The discovery of this planet is one of the greatest triumphs ever achieved by this wonderful science.

On the night of the 23rd of September, 1846, it was discovered at a point in the heavens, upwards of 2,862 millions of miles from the sun, that is, more than 30 times the distance of our earth from that luminary! But more wonderful still, the existence of such a planet had been confidently predicted by several astronomers long before its discovery; and at length, by one of the most difficult problems ever solved by human ingenuity, the exact place in the heavens in which it would be found at a given time, was determined. The problem referred to is called the *inverse problem of perturbations*. The usual problem is: given a disturbing cause, its amount and direction, to find the effect on the body disturbed. This problem is comparatively easy, because it is known, from the nature of attraction, that the disturbing influences of the planets upon each other, will always be in proportion to their masses and proximity. But in the *inverse* problem it is required to find, from certain observed disturbances, the position and path of the body producing them. The successful solution of this most difficult problem led to the discovery of Neptune. It had been found that the *perturbations* of Uranus, that is, certain irregularities in his motion and path, could not be accounted for, either by the separate or combined influences of the planets between him and the sun; and hence it was ingeniously conjectured that they must be occasioned by some unknown planetary body, moving beyond his orbit, which was then considered to be the farthest out in the system.

The honor of this memorable discovery, belongs equally to M. Le

Verrier, an eminent French mathematician, and Mr. Adams, a distinguished member of the University of Cambridge, who, unconscious of each other's labours, arrived almost simultaneously at the same result. Mr. Adams, indeed, had completed his observations a few weeks before M. Le Verrier, and had requested the Cambridge Professor of Astronomy to search for the planet in the direction in which he computed it would be found; but, unfortunately for him, some delay took place, and thus he lost the honor of being the first discoverer. For in the meantime, the discovery was announced by Dr. Galle, of the Berlin Observatory, who had been requested by M. Le Verrier to employ the great telescope at his command in looking out for it, on the night of the 23rd of September. This was promptly done, and within twice the moon's breadth of the spot indicated by M. Le Verrier, the planet NEPTUNE was discovered!

The mean distance of Neptune from the sun is 2,862,457,000 miles; his periodic revolution is 60,126 days and 17 hours, or rather more than 164¾ years; and his real diameter about 31,000 miles. Two *satellites* have already been discovered in attendance upon him, and it is conjectured there are others. There is also an indication of *rings*, as in the planet Saturn.

DIAMETERS OF THE PLANETS.—If we know the *diameters* of the planets we can tell their actual and relative magnitudes. This column of the table is, therefore, of great importance. To assist the memory, it is recommended to take the following remarkable combinations of figures as expressive of the diameters of the sun and the planets:—888,000, 88,000, 80,000, 8,000, 4,000, 3,000, 2,000. The first number gives the Sun's diameter in English miles; the second (dropping an 8) gives Jupiter's; the third, Saturn's; the fourth, the diameters of the Earth and Venus; the fifth (the half of 8) that of Mars; the sixth (the next number to 4), Mercury's; and the seventh (the next number to 3) the Moon's.

The preceding combinations of figures give us a sufficiently accurate idea, and one which we are not likely to forget, of the diameters of all the planets, except Herschel, Neptune, and the Asteroids. In some instances the numbers given are a little too high, and in others a little too low; but they are sufficiently accurate for a general idea. In fact, the authorities differ with regard to the precise length of the diameters of most of the planets.

The diameter of a globe is equal to about one-third of its circumference (as 7 to 22 nearly). Hence, if we know the diameter of a planet, we can tell its circumference; and by multiplying the circumference by the diameter, we get its superficies, or the contents of its surface; and by multiplying the superficies by the sixth part of the diameter, its solid contents.

The superficies or surfaces of spherical bodies are proportional to the squares of their diameters, and their solid contents or masses to the cubes of their diameters. Hence the relative magnitudes of the sun and the planets are calculated. The diameter of Saturn, for instance, is to the diameter of the earth as 10 to 1 (80,000 to 8,000); and as the square of 10 is 100, the surface of Saturn is 100 times greater than the

surface of the earth. Again, the diameter of the earth is to that of the moon as 4 to 1 (8,000 to 2,000); and hence their surfaces are as the square of 4 to the square of 1—that is, as 16 to 1. The earth, therefore, appears about 16 times as large to the inhabitants of the moon, as the moon does to us.

The *real* diameters of the sun and planets are calculated from their apparent diameters and actual distances. The apparent diameter of the sun subtends an angle of about *half* a degree. That is, if from the eye of the observer two lines are supposed to be drawn, one to the top of the sun and the other to the bottom, they will include an angle of rather more than half a degree. (In winter, when the sun is nearest to us, the angle subtended by the diameter of the sun is 32′ 30″, and at midsummer, 31′ 30″.) The apparent diameter of the sun, therefore, will enable us to judge of angular distances upon the surface of the heavens. If two stars, for instance, appear to be about 10 times the apparent diameter of the sun from each other, they are about 5 degrees apart.

Distances of the planets from the sun.—By taking the following figures as expressive of the mean distances of the planets from the sun, *in millions of miles*, the memory will be greatly assisted:—Mercury, 36; Venus, 69; the Earth, 95; Mars, 144; Jupiter, 490; Saturn, 900; Herschel, 1,800; Neptune, 2,800. In the first number we get the second figure (6) by doubling the first (3); the last figure (6) in the first number is the same as the first in the second, and the second figure in the second number (69) will be easily recollected from the proportions 3, 6, 9. By transposing the figures which express the distance of Venus (69), we have the earth's very nearly. The square of 12 (144) gives us the distance of Mars (144); the last figure in the preceding number (4) suggests 490, the distance of Jupiter; the 9 in 490 suggests 900, the distance of Saturn; *twice* the distance of Saturn gives us the distance of Herschel (1,800); and by doubling the first figure in 1,800 (Herschel's distance), we get 2,800, the distance of Neptune. By looking at the numbers this will be easily understood—36, 69, 95, 144, 490, 900, 1,800, 2,800.

The squares of the periodic times of the planets are proportional to the cubes of their distances from the sun. Hence, as the distance of the earth from the sun has been found by the transits of Venus to be about 95,000,000 miles, we can determine the distance of any other planet, if we know its periodic time—that is, the time in which it completes its revolution round the sun. For instance, as the square of 365 (the periodic time of the earth), is to the square of 88 (the periodic time of Mercury), so is the cube of 95,000,000 (the mean distance of the earth), to a fourth number, which will be the cube of the distance required. And if the cube root of this be extracted, the answer will be about 36,000.000 of miles. This important law was discovered by Kepler, and fully demonstrated by Sir Isaac Newton.

Rotation of the planets.—The following will give a clear and *permanent* general idea of the length of the days of the principal planets, as measured by the time which they take to turn once round upon their axes before the sun:—The length of the days of Mercury,

Venus, and Mars, is much the same as the length of those of the earth—that is about 24 hours. Or, in other words, the length of the days of the *four* planets next the sun (including the *earth*) is nearly the same—that is about 24 hours; while the length of the days of the two next planets, namely, Jupiter and Saturn, is *not half* so long as that of the earth's—that is, under 12 hours.

ANNUAL REVOLUTION OF THE PLANETS.—The YEARS of the planets are measured by their periodic revolutions round the sun. The following will give a *general* idea of the length of each:—the length of Mercury's year is about *one-fourth* of the earth's, that is, about 3 months. The year of Venus is about *two-thirds* of the earth's, that is about 8 months. The year of Mars is nearly twice as long as *ours*. Jupiter's year is nearly equal to 12 of ours—that is, a year with us would only be a *month* at the planet Jupiter; Saturn's year is nearly equal to 30 of ours; and Herschel's is more than 84 times as long. Scarcely *two-thirds* of this planet's year have elapsed since its discovery in 1781. And the year of Neptune, the last discovered planet, is nearly twice as long as that of Herschel!

VELOCITIES OF PLANETS IN THEIR ORBITS.—Mercury travels in his orbit at the rate of 1,800 miles in a minute; Venus, 1,380; the earth, 1,110; Mars, 900; Jupiter, 480; Saturn, 360; Herschel, 240; and Neptune, 170.

From the distances and periodic times of the planets, their mean velocities in their orbits are easily calculated. The earth's distance from the sun, for instance, is about 95,000,000 of miles, and its periodic time is about 365 days. Hence, if the earth describes a circle, the semi-diameter of which is 95,000,000 of miles, in 365 days, what portion of its circumference will it describe in one day? And if it travels so much in 24 hours, what will be its motion per hour?

ORBITS OF THE PLANETS.—The ORBITS of the planets are *elliptical*; but compared with their great magnitudes, they differ little from perfect circles. In fact, they are just like the earth's orbit in form, and like the *plane* of its orbit, all their planes pass through the centre of the sun.—See pages 17, 22, and 31.

INCLINATION OF THE ORBITS OF THE PLANETS.—The planets move round the sun in nearly the same plane or level.[a] These are, however, inclined to each other at small angles, and as they all pass through the centre of the sun, they intersect each other. None of their planes make a greater angle with that of the earth than seven

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[a] *Inclination of orbits to the ecliptic.*—Mercury, 7 deg. 9 min.; Venus, 3 deg. 23 min. 28 sec.; Mars, 1 deg. 51 min. 6 sec.; Vesta, 7 deg. 8 min. 9 sec.; Juno, 13 deg. 4 min. 9 sec.; Ceres, 10 deg. 37 min. 26 sec.; Pallas, 34 deg. 34 min. 55 sec.; Jupiter, 1 deg. 18 min. 51 sec.; Saturn, 2 deg. 29 min. 35 sec.; Uranus, 46 min. 28 sec.; the Moon, 5 deg. 9 min. 3 sec.

degrees and a few minutes;[a] while most of them make much smaller angles with it.

FIGURES OF THE PLANETS.—The planets, like the earth, are *oblate* spheroids, and from the same causes.—See note, p. 43. From the great rapidity with which Jupiter and Saturn turn on their axes, we should expect that they are much more *oblate* than the other planets, and such is the fact. The *equatorial* diameter of Jupiter is to his polar as 14 to 13; and Saturn's equatorial diameter exceeds his polar in nearly the same proportion.

The equatorial diameter of Jupiter is more than 6,000 miles longer than his polar one. Hence, when viewed through a good telescope, he appears to be oval.

DENSITIES OF THE PLANETS.—The density of bodies is ascertained by comparing their *bulk* with their *weight*—or, in other words, with the *quantity of matter* which they contain. And as the power of attraction in any body is in proportion to the quantity of matter which it contains, the densities of the planets have been determined by comparing their magnitudes with the power of attraction which they exert on other bodies in similar circumstances.

If the density of water be taken as 1, the sun will be $1\frac{2}{14}$; of Mercury, $9\frac{1}{8}$; of Venus, $5\frac{1}{15}$; of the Earth, nearly 5; of the Moon, $3\frac{1}{2}$; of Mars, $3\frac{1}{4}$; of Jupiter, $1\frac{1}{24}$; of Saturn, $0\frac{13}{32}$; of Herschel, $0\frac{99}{100}$.

The density of the sun is little more than the density of water, while the average density of the earth is nearly *five* times that of water. Hence the density of the earth is nearly *five* times as great as the density of the sun; but so great is the magnitude of the sun, that it contains about 333,000 times as much matter as the earth—or more than 600 times as much as all the planets taken together!

THE SUN'S ATTRACTION, LIGHT, HEAT, &c.—The sun's *attraction*, *light*, *heat*, and *apparent magnitude* with respect to the planets, are supposed to be inversely proportional to the squares of their distances from him. Hence, if the earth were where Mercury is, the sun would appear to us nearly seven times as large as it now does, and his heat, light, and attractive powers would be increased in the same proportion; for the squares of the distances of the earth and Mercury from the sun are nearly as 7 to 1. Again, Herschel's distance from the sun, compared to Saturn's, is as 18 to 9 (1800 millions to 900), that is, as 2 to 1; and, consequently the attraction, heat, light, and apparent magnitude of the sun at Herschel are *four* times less (the square of 2) than they are at Saturn. We are not, however, to measure the degrees of heat and cold experienced at the planets with reference to our own. We are ignorant of their structure, surfaces, and atmospheres, and we cannot therefore know what effect may be produced upon them by the solar rays. We have no reason, there-

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[a] Except some of the *asteroids*, as Juno, Ceres, and Pallas.

fore, to conclude that the planets are either too warm or too cold to be inhabited. One thing we may conclude—that the All-wise and All-good Creator has made nothing in vain.

THE MOON.—The MOON revolves round the earth in a *month*, and with the earth she is carried round the sun in the course of a year. And as she always presents the same face or side to the earth, it follows that she must turn once round her axis in the course of a month. For if she had no rotation on her axis, every part of her surface would be presented to the earth in the course of her revolution round it. Hence, as the moon turns but once round her axis in a month, before the sun, her *day* and *night* must be each nearly a fortnight long. And as the moon enlightens the earth by reflecting the light of the sun, so the earth illumines that side of the moon that is next to it, while turned away from the sun. The half of the moon which is towards the earth may be said, therefore, to have no darkness at all; for during the fortnight in which it is turned away from the sun, the earth shines upon it with a disk sixteen times as large as that of the full moon. The inhabitants of the other half of the moon never see the earth at all, and are therefore in darkness for the half of every month, with the exception of the light which they receive from the stars.[a]

The distance of the moon from the earth is about 240,000 miles. Her *apparent* diameter is about equal to that of the sun's, though it is really 400 times less; but this is because she is 400 times nearer to us than the sun is.

When the moon is between the earth and the sun, her enlightened hemisphere is turned from us, and the side which is next to us is darkened, and therefore invisible. She is then said to change. As she proceeds in her course she turns a bright edge towards us, which we call the *new moon*. If we observe her next evening, we shall find that she has moved about 13° farther east of the sun than on the preceding evening, and that her crescent of light has increased in breadth. Repeating our observations, we shall find that, as she progresses eastward from the sun, her enlightened surface comes more and more into view till she arrives at her *first quarter*, and comes to the meridian at sun-set. She has then completed half her course, from the *new* to the *full* moon; and as half of her enlightened disk is turned towards the earth, we say it is *half moon*. After her first quarter she is said to be *gibbous*,[b] because she presents more than half of her enlightened hemisphere to the earth. And as she recedes farther and farther from the sun, she appears more and more gibbous, till she completes half of her revolution round the earth, and is seen rising in the east when the sun is setting in the west. She then presents the *whole* of her enlightened hemisphere to the earth, and it is

[a] Unless they pass over to the hemisphere next the earth.
[b] From *gibbus*, a Latin word for *hunch*-backed, convex.

then said to be *full moon*. In this position the moon is said to be in *opposition*, because she is then on the *opposite* side of the earth with respect to the sun; or, in other words, the earth is between her and the sun. And at new moon she is said to be in *conjunction*, because she is between the earth and the sun.

As she proceeds in her orbit she becomes gibbous again, and presents the same changes as before, but in an inverted order, till we see her in the morning like a fine thread of light, a little to the west of the rising sun. For the next day or two she rises in conjunction with the sun, and is consequently lost to our view till, having passed the sun to the eastward, we hail her appearance again as the NEW MOON!

The crescent or illuminated part of the moon is always turned in the direction of the sun. After her conjunction, therefore, or while she is *increasing*, the convex part of the crescent is turned to the west, and the horns or hollow part of it to the east. Before her conjunction, or while she is *waning*, the reverse takes place. These different *appearances* of the moon are called her PHASES, and they prove that she shines not by her own light; for if she did, she would always present to us a full enlightened orb like the sun.

If we observe the motion of the moon in connexion with the position of any fixed star, we shall be convinced that she moves from *west* to east, and not from east to west, as she *appears* to do. For if the star is to the *eastward* of the moon, the distance between them will gradually diminish till they appear in the same direction from our eye. The moon will then pass to the *eastward* of the star, and the distance between them will gradually increase. In 24 hours after we shall find that the moon has moved 13 degrees to the eastward; and if we continue our observations we shall find that in 27 days, 7 hours, 43 minutes, and 4 seconds, she having made the circuit of the heavens, will again be in a line with the same fixed star. This is called a periodic or *sidereal* revolution of the moon. But though the moon makes a complete revolution round the earth in 27 days, 7 hours, 43 minutes, and 4 seconds, it requires 2 days and 5 hours additional to bring her to that position in which the same face will be presented to the sun. This period, which is called a *synodical* month, consists of 29 days, 12 hours, and 44 minutes, and it is reckoned from *new* moon to *new* moon. This difference arises from the earth's annual motion in her orbit; for while the moon is revolving round the earth, the earth is advancing in her orbit. The moon, therefore, after completing one revolution, will have to move several degrees farther before she can come again into the same position with respect to the earth and sun. This may be illustrated by the motions of the hands of a watch. At 12 o'clock they start together, and at one, the minute-hand having made a complete revolution round the dial, is on a line with the figure XII. But, in the meantime, the hour-hand has moved forward in its course as far as

the figure I; and it will consequently take the minute-hand five minutes, in addition to the hour, to overtake it.

MAGNITUDE OF THE EARTH.—As the magnitude of the earth is the scale or standard by which we are enabled to form a conception of the magnitudes of the heavenly bodies, and of the immensity of the universe, we should endeavour to impress the minds of our pupils with adequate ideas of its vast extent. In a preceding part of this book its dimensions as a globe, and the extent of its surface in square miles have been given (pp. 84 and 153); but, as mere calculations are seldom *realized* by young persons, something should be done to give them a practical and *intuitive* proof of its amazing magnitude. With this view they should be conducted to some elevated place in the neighbourhood, and be told to look around them; and however extensive the landscape before them may be, they should be told that it is little more than a mere spot, when compared with the whole extent of the surface of the earth! For even if it should comprise a circle of 150 miles in circumference, it would scarcely amount to the hundred thousandth part of the earth's surface. We should therefore have to conceive 100,000 landscapes as large as the one we are contemplating, before we could form an adequate idea of the magnitude of the earth!

MAGNITUDE OF THE SUN.—But what is the magnitude of the earth, amazing as it is, when compared to the magnitude of the sun? The length of the sun's diameter is, as we have seen, about 888,000 miles, that is, nearly four times the distance of the moon from the earth (240,000). Hence, if the centre of the sun were in the exact situation in which the centre of the earth now is, its surface or body would extend to the moon, and 200,000 miles beyond it; or, in other words, about twice as far as the moon!

Again, if the sun were a hollow sphere, and our earth, as large as it now is, in the centre of it, the distance between the earth and the inner surface of the sun would be 440,000 miles. Half-way between us and the inner or concave surface of the sun, might be the moon, as large as she now is, and at the same distance from us; and if perforations were made in the surface of the sun, so as to admit the luminous matter with which it is covered, to represent the stars, the appearance presented to us would differ little from that of the visible heavens; that is, the concave surface of the sun would appear to be as distant and as large as the whole universe appears to the ordinary observer.

ZODIACAL LIGHT.—The nature of this beautiful and interesting phenomenon is not yet known, though it was noticed so far back as 1683 by the Elder Cassini. Some astronomers suppose it to be the denser portion of an ether diffused through space, and sufficiently massive beyond the orbit of Venus to reflect light. Humboldt in his "Cosmos," considers it "a vapoury flattened ring freely revolving in space between the orbits of Mars and Venus." Its appearance is that of a conical-shaped light extending from the horizon nearly along the course of the ecliptic, the vertex attaining distances of 70° or 80° from the sun's place. In these latitudes it is visible in Spring before sun-set, and in Autumn after sun-set. It is much more brilliant in tropical climates.

ASTRONOMICAL TERMS.

[As definitions or explanations of the following TERMS have been given in the preceding part of this work, it will be sufficient to refer the reader to the pages in which each may be found.]

SUPPLEMENTARY DEFINITIONS.—An Artificial Globe is a miniature representation of the earth or heavens. The one that represents the *earth* is called the Terrestrial, and the one that represents the *heavens* the Celestial Globe. Each globe is hung in a brass ring called the Brazen or Universal Meridian, and turns upon an axis or wire, which passes through each pole. The Brazen Meridian is divided into four quadrants of 90 degrees each, two of which begin at the equator and increase towards the poles, which serve to show the latitude of places on the Terrestrial Globe, and the declination of the sun, moon, and stars, on the Celestial. The other two quadrants are numbered from the poles to the equator, and serve to elevate or depress the poles above or below the horizon for any latitude.

The Brazen Meridian is let into two notches made in a broad flat ring called the Wooden Horizon, the upper surface of which divides the globe into two equal parts called the Upper and Lower Hemispheres: one of the notches is in the North point of the horizon, and the other in the South. The graduated side of the Brazen Meridian faces the Eastern side of the horizon. The Wooden Horizon is divided into three concentric circles, the innermost of which contains the several points of the Mariner's Compass; the next has the signs, characters, and graduations of the Twelve Signs of the Zodiac; and the exterior one is a Calendar of the several months and days. By the two last the sun's place in the ecliptic may be readily found for every day in the year.

At the north pole of each globe there is usually affixed a small circle of brass called the Hour Circle, because divided into hours and minutes, and furnished with an Index-hand, which goes over all the twenty-four hours as the globe itself is turned on its axis. The motion of the Terrestrial Globe being from west to east, (like the earth which it represents,) the hours increase in this direction; but the motion of the Celestial Globe being from east to west (like the apparent motion of the heavens), the hours increase in this direction accordingly. Some globes have no brass plate, but have the Hours marked on the Globe itself.

The Quadrant of Altitude is a thin slip of brass divided into degrees, and corresponding to a quadrant or fourth part of the Equator and Brazen Meridian. It is used for measuring the distances and positions of places on the Globe.

The Elevation of the Pole at any place is the height of the Pole above the Horizon of that place measured on the Meridian. It is always the same number of degrees as the Latitude (see page 44).

The Latitude of a heavenly body is its distance north or south from the *ecliptic*, reckoned on the quadrant of altitude towards the pole of the ecliptic. The sun has no latitude because he is always in the ecliptic.

The Longitude of a heavenly body is its distance from the first point of Aries, measured on the ecliptic *eastward* round the globe.

The Right Ascension of a heavenly body is its distance east from the first point of Aries measured on the equator.[a]

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[a] It is easy to convert Right Ascension into time, or time into Right Ascension; for if a heavenly body is one hour in passing over 15°, it will be one-fifteenth of an hour, or four minutes, in passing over 1°. If the first point of Aries, for instance, be on the meridian at 12 o'clock, the next hour line, which is 15° east of it, will come to the meridian at 1 o'clock; the second hour line at 2 o'clock; the third, at 3 o'clock, and so on. Of any two bodies whose Right Ascension are given, that one will pass the meridian *first* which has the least Right Ascension; and in the proportion of 1 hour for every 15 degrees.

Declination and Right Ascension in the heavens, correspond to Latitude and Longitude on the earth.

Vertical Circles are circles supposed to be drawn through the Zenith and Nadir of any place, cutting the horizon at right angles.

The Prime Vertical is that which passes through the east and west points of the horizon, cutting the meridian of the place at right angles.

The Azimuth of a heavenly body is that arc of the horizon, intercepted between a vertical circle passing through the object, and the north or south points of the horizon.

The Amplitude of a heavenly body is that arc of the horizon, comprehended between an object at rising or setting, and the east or west points of the horizon.

The Colures are two great circles which pass through the poles of the heavens, dividing the ecliptic into four equal parts, and mark the seasons of the year. The Equinoctial Colure passes through the Equinoxes at Aries and Libra; and the Solstitial Colure passes through the Solstitial points, or the points of the sun's greatest declination north and south.

SKETCH OF THE HISTORY OF ASTRONOMY.—The science of Astronomy was cultivated in the first ages of the world by the Chaldeans, Egyptians, and Phœnicians;[a] and, according to Josephus, by the immediate descendants of Adam, particularly by the sons of Seth. In the Book of Job several of the constellations are mentioned; as—"Canst thou bind the sweet influences of the *Pleiades*, or loose the bands of *Orion*? Canst thou bring forth *Mazzaroth* in his season, or canst thou guide *Arcturus* with his sons?" And in the works of the oldest of the heathen poets, Hesiod and Homer, similar allusions are made to the constellations into which the principal stars must at that early period of the world have been grouped.

The Greeks derived their first knowledge of astronomy from Egypt, through Thales the Milesian, who flourished about 640 years before the Christian era. He was so well acquainted with the motions of the heavenly bodies, that he explained eclipses, and even predicted one. He also taught the sphericity of the earth, and divided it into five zones. The solstices and equinoxes he also explained; and divided the year into 365 days. His disciples and successors, particularly Pythagoras and his pupil Philolaus, maintained the same opinions, but with so little success, in consequence of the opposition of the people who judged only from the evidence of their senses, that the true doctrine of the heavens was after their time lost to the world for two thousand years.

About 130 years after the Christian era, Ptolemy, a celebrated

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[a] The Chinese were from a very early period of the world acquainted with many astronomical principles; particularly with the nature of eclipses.

Egyptian philosopher, published what has been called the Ptolemaic System of Astronomy. According to this system, the earth is at rest in the centre of the universe, and the heavens revolve round it from east to west in 24 hours, carrying with them in the same time, and in the same direction, the sun, moon, and stars. The difficulties of his system, such as the retrograde motions and stationary appearances of the planets, he endeavoured to explain by the introduction of cycles, epicycles, and other ingenious but scarcely intelligible hypotheses. This system, though false in fact and absurd in theory, was believed and maintained for 1,400 years.

In 1530, Nicholas Copernicus, a native of Thorn, in Polish Prussia, discovered and published to the world the system of the universe which goes by his name. The truth of his system was afterwards fully established by Kepler, Galileo, and Newton; and is now by the learned of all countries universally believed.

PROBLEMS ON THE GLOBES.

PROBLEM 1.—*To find the latitude and longitude of any place.*

1. Turn the globe till the given place comes exactly under the brazen meridian, and the degree marked over it is the latitude required. 2. The globe remaining in this position, the degree of the equator cut by the brazen meridian is the longitude required. Thus, Dublin will be found to be 53° 21′ N.L., and 6° 18′ W.L.

Exercises.—1. Find the latitudes and longitudes of the capitals of Europe; also, of the principal cities of Asia, Africa, and America. 2. Find all the places which have no latitude. 3. Find all the places which have no longitude. 4. Find the place which has neither latitude nor longitude. 5. Find those places which have the greatest latitude and longitude.

PROBLEM 2.—*The latitude and longitude of any place being given, to find it on the globe.*

1. Look for the given longitude on the equator, and bring it to the graduated side of the brass meridian; then under the given degree of latitude on the meridian is the place required. Thus, suppose we are told that two ships met in 36° 20′ N.L., and in 32° W.L., we shall find that it must have been in the Atlantic Ocean, a little to the south of the Azores.

Exercises.—1. Find all those places which have the same latitude at any given place. 2. Find all places having the same longitude at any given place. 3. What towns and places lie nearly in the following latitude and longitude?

N.L. 41°, and E.L. 29°.	N.L. 40° 42′, and W.L. 74°.
S.L. 33°, and W.L. 71° 30′.	S.L. 15° 55′, and W.L. 5° 42′.
N.L. 22° 34′, and E.L. 84° 22′.	N.L. 48° 50′, and E.L. 2° 20′.
S.L. 34° 25′ and W.L. 58° 16′.	S.L. 12° 2′, and W L. 77° 7′.

PROBLEM 3.—*To find the difference of latitude or longitude between any two places.*

1. If the places be in the same hemisphere, subtract the latitude of

the one from the other; if in different hemispheres, add the latitude of the one to that of the other. 2. If the longitudes of the places in question are both in the same direction, that is, both east or both west, subtract the less from the greater, and the remainder will be the difference required; but if the longitude of the one place is east, and the other west, add their longitudes together, and the sum will be the difference required.[a]

PROBLEM 4.—*To find the distance between any two places on the globe.*

Lay the graduated edge of the quadrant of altitude over both the places and count the number of degrees intercepted between them; which being multiplied by 60 for geographical, or $69\frac{1}{10}$ for English miles, will give the distance required. When the distance is more than 90°, stretch a thread from the one place to the other, and measure the distance on the equator. Thus, the distance between London and Rome will be found to be 12° 45′, or 881 miles.[a]

PROBLEM 5.—*To rectify the globe for the latitude of any place.*

Elevate the north or south pole above the horizon as many degrees as are equal to the latitude of the given place. Thus, if the place be Dublin, the north pole should be elevated 53° 21′ above the horizon (because that is the latitude of Dublin).

PROBLEM 6.—*To find the bearing or direction of one place from another.*

Rectify the globe to the latitude of one of the places, and bring it to the brass meridian; then fix the quadrant of altitude over that place, and extend it from thence to the other, and the end will point out the direction upon the horizon. Thus, if it were required to know the direction of Rome from London, the globe being rectified, London brought to the brass meridian, and the end of the quadrant of altitude laid to Rome, you will find the end fall against that part of the wooden horizon marked S.E., or south-east.

PROBLEM 7.—*To find the sun's longitude (or place in the ecliptic) for any given time.*

Find the day of the month on the wooden horizon, and opposite to it, in the adjoining circle, are the sign and degree of the ecliptic in which the sun is for that day, find the same sign and degree of the ecliptic on the globe, and that is the sun's place in the ecliptic.[b] Thus, on the 11th of May, the sun's place will be found to be in the 21st degree of Taurus.

PROBLEM 8.—*The day of the month being given, to find the sun's declination, and all those places where he will be vertical on that day.*

1. The sun's place in the ecliptic for the given day being brought to the meridian, the degree marked over it is the declination. 2. Turn the globe, and all the places which pass under that degree will have the sun vertical on that day. Thus, on the 10th of May, the sun's declination

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[a] See Chapter IV., page 34, for examples.

[b] This problem may likewise be performed on the celestial globe.

will be found to be 17° 30′, and all those people who live under that parallel of north latitude have the sun in their zenith that day at noon.

PROBLEM 9.—*To find the sun's meridian altitude on a given day at any place.*

Rectify the globe for the latitude of the place; and find the sun's place in the ecliptic, and bring it to the brazen meridian. Then count the number of degrees on the meridian between the sun's place and the horizon, and you will have the altitude required.

CELESTIAL GLOBE.

PROBLEM 10.—*To find the declination of the sun or a star.*

Bring the sun or star to the brass meridian, and the degree over it is its declination. Thus, the sun's declination, June 21st, is 23½ degrees N.; and on the 21st of December, 23½ degrees S.

PROBLEM 11.—*To find the right ascension of the sun or a star.*

Bring the sun's place, or the star, to the brazen meridian, and the degree of the equinoctial cut by the meridian, is the right ascension. Thus, the sun's right ascension on the 21st of June, is 90°, and on the 21st of December 270°.

PROBLEM 12.—*To find the latitude and longitude of a star.*

Put the centre of the quadrant of altitude on the pole of the ecliptic; and its graduated edge on the star; then the degree of the quadrant cut by the star is its latitude; and the degree of the ecliptic cut by the quadrant is its longitude.

PROBLEM 13.—*To find the time when any of the heavenly bodies rise, set, or come to the meridian.*

Rectify the globe to the latitude of the place; bring the sun's place in the ecliptic to the meridian, and set the index to XII. Then turn the globe till the given body comes to the eastern edge of the horizon, and the index will show the time of its rising. Bring the body to the meridian, and the index shows the time of its culmination or southing; then bring it to the western edge of the horizon, and the index will, in like manner, show the time of its setting.

PROBLEM 14.[a]—*To represent the face of the heavens at any given time and place, so as to point out all the constellations and remarkable stars there visible.*

Elevate the globe to the latitude of the place where you are, and set it due N. and S. Bring the sun's place in the ecliptic for the given day to the meridian, and set the index to XII. at noon; turn the globe westward, till the index points to the given hour; then the surface of the globe represents the exact face of the heavens at the given place.

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[a] If the globe be taken out into the open air, on a clear night, and set due N. and S., the relative situations of the constellations and the remarkable stars then visible, may easily be distinguished.

A GENERAL

TEXT-BOOK ON GEOGRAPHY.

[The preceding part of this work, which treats of Geography as a *science*, is intended for the use of TEACHERS and their MORE ADVANCED PUPILS. The part which follows may be divided into TWO COURSES, one for BEGINNERS,[a] as Definitions, General Divisions, and those portions of the text which are printed in larger type; and the other, or SECOND COURSE, will serve as a general TEXT-BOOK on the subject of Geography.]

PRELIMINARY DEFINITIONS.

GEOGRAPHY is a description of the EARTH. See pages 7 and 8.

The form or shape of the earth is round like a ball or GLOBE.

The CIRCUMFERENCE of the earth or a circle which would divide it into two equal parts or hemispheres, is nearly 25,000 miles.

The DIAMETER of the earth, or a straight line from any point of its surface through the centre to the opposite point, is nearly 8,000 miles. See page 34.

The AXIS of the earth is an imaginary line passing through its centre from north to south. The ends or extreme points of the earth's axis are called the POLES; the upper the *north* pole, and the lower the *south* pole.

The earth turns round its axis once in twenty-four hours, producing DAY and NIGHT, alternately. This is called its DIURNAL motion. It also moves round the sun in the course of a year, producing the SEASONS in succession. This is called its ANNUAL motion. See page 17 for proofs and illustrations.

The EQUATOR is an imaginary circle passing round the middle of

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[a] In the author's "Introduction to Geography and History," page 11, will be found a number of "*Preparatory* questions on Geography," which are calculated to enlist the feelings of young persons in favour of the study; and to make many things plain and easy to them, which they might otherwise find to be abstruse and difficult. See, also, his "Method of Teaching Geography," page 149 (in this work.)

the earth, at an *equal* distance from each pole. It divides the earth into two equal parts, which are called the northern and southern HEMISPHERES.

LATITUDE is the distance of a place north or south from the equator. See page 36.

PARALLELS OF LATITUDE are circles drawn round the globe *parallel* to the equator.

The most important parallels of latitude are the two TROPICS,[a] and the two POLAR[b] circles.

The tropics and the polar circles divide the globe into five ZONES or belts; namely, one *torrid*, two *temperate*, and two *frigid* zones. See the diagram, page 35.

The TORRID zone lies between the tropics; the TEMPERATE zones between the tropics and the polar circles; and the FRIGID zones between the polar circles and the poles.

A MERIDIAN is an imaginary line running through any place north and south from pole to pole.[c]

The meridian which passes through Greenwich,[d] is called the FIRST MERIDIAN.

LONGITUDE is the distance of a place east or west from the first meridian. See page 37.

The circle which crosses the equator obliquely is called the ECLIPTIC. The ecliptic marks the line along which the sun's rays are vertical or overhead, in the course of the year.[e]

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[a] The sun is never vertical or overhead to any place on the earth farther from the equator than 23½ degrees north and south, through which limits the tropics are supposed to be drawn; Cancer to the north, and Capricorn to the south. These parallels are called *tropics*, because when, by the motion of the earth, the sun arrives at either of them, he *turns* back, as it were, towards the other. Before turning back, he apparently rests or attains the same elevation for two or three days. These periods are called the summer and winter SOLSTICES, that is, the *standing* or resting of the *sun*.

[b] When the sun is 23½ degrees south of the equator, that is, in the tropic of Capricorn, his rays fall short of the North Pole by the same number of degrees (23½). Through this point, a circle parallel to the equator, is supposed to be drawn, which is called the *Arctic* or North Polar Circle; and through the corresponding point in the southern hemisphere a similar circle is supposed to be drawn, which is called the *Antarctic* or South Polar Circle. The North Polar Circle is called *Arctic*, in allusion to its corresponding circle in the heavens, which passes through the constellation ARCTOS, or the Great *Bear*; and *Antarctic* means *opposite to* the Arctic.

[c] Such a line is evidently a *semicircle*, and if carried round the whole globe, a circle. See pages 35 and 38.

[d] In the vicinity of London, where the Royal Observatory is.

[e] The ecliptic properly refers to the heavens, and represents the circle which the sun, by the earth's annually revolving round it, seems to

The ZENITH is that point in the heavens which is directly over the head of the observer.

The NADIR is the point directly opposite to the zenith.

The SENSIBLE HORIZON is the circle bounding the view of the observer by the apparent meeting of the earth and sky.

The RATIONAL HORIZON[a] is a great circle whose PLANE passes through the centre of the earth *parallel* to the plane of the sensible horizon.

The PLANE of the sensible horizon is the level or *plain* surface on which the spectator stands.

The CARDINAL, or four principal points of the horizon, are the NORTH, SOUTH, EAST, and WEST. See page 149.

NATURAL DIVISIONS OF THE EARTH'S SURFACE.

The surface of the earth consists of land and water. The water covers nearly three-fourths of the earth's surface. See page 153.

The LAND is divided into continents, islands, peninsulas, capes, promontories, and isthmuses; and the WATER, into oceans, seas, gulfs, bays, channels, straits, and lakes.

DIVISIONS OF THE LAND.

A CONTINENT is a large extent of land *containing* several countries.[b] An ISLAND is a portion of land entirely surrounded by water. A PENINSULA is a portion of land *almost* surrounded by water. A CAPE or *head*land runs out into the sea; and if elevated or *mountainous*, it is called a PROMONTORY. An ISTHMUS[c] is a narrow neck of land, connecting two larger portions together.

A TABLE-LAND OF PLATEAU *(platō)* is a plain or tract of flat land elevated considerably above the level of the sea. An OASIS is a fertile spot in the midst of desert. A WATERSHED is the ridge or high land

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describe among the fixed stars in the course of the year. The sun is always in the ecliptic, and hence, when the moon comes in a line between us and the sun, his rays are partially *eclipsed* or obscured. This is called an *eclipse* of the sun, and it is from this circumstance that the sun's apparent path in the heavens is called the *ecliptic*. See page 26.

[a] The rational horizon is the circle which would bound our view if we could see the one-half of the globe. It is the circle which separates the visible hemisphere of the heavens from that which is not visible. The broad wooden circle on a terrestrial globe represents the rational horizon.

[b] The learner should be required to point out, on the Map of the World, examples of each of the divisions of land and water.

[c] *Isthmus.*—The human *neck*, *head*, and *body* will serve to illustrate the geographical terms *isthmus*, *peninsula*, and *mainland*. In fact, *isthmos*, in Greek, from which the word is derived, means *the neck*. By curving or holding out one of his arms less or more from his body, the teacher can illustrate what is meant in geography by *arms* of the sea, *gulfs*, *bays*, *creeks*, and *harbours*.

between the sources of rivers which flow in opposite directions. The BASIN of a river is the whole extent of a country drained by it, and its affluents or tributaries. A DELTA[a] is a *triangular* tract of land between the forked mouths or branches of a river.

DIVISIONS OF THE WATER.

An OCEAN is a large extent of water, corresponding to a *continent*. A SEA is smaller than an ocean, and is generally bounded or confined by land. A GULF corresponds to a *peninsula*, and is almost surrounded by land. A BAY has a wider opening than a gulf, and is, generally speaking, not so large. A SEA containing a cluster of islands is called an ARCHIPELAGO.[b] A STRAIT is a narrow passage of water connecting two seas: it corresponds to an *isthmus*. A CHANNEL differs from a *strait*, in being much wider. A CREEK is a narrow portion of water running up into the land. A HARBOUR or HAVEN is a part of the sea so nearly surrounded by land as to afford complete security for ships. A ROAD or ROADSTEAD affords safe anchorage near the land, with partial shelter. The mouth of a river widening into the sea, is called an ESTUARY or FRITH. A LAKE[c] is a portion of water entirely surrounded by land: it corresponds to an *island*.

An ARTIFICIAL GLOBE is a representation of the *form* of the earth, with its divisions into land and water.

A MAP is a representation of the earth, or of a part of it, on a *plane* surface. See page 151.

The top of the map is the north; the bottom, the south; the right-hand side, the east; and the left-hand side, the west. In a map of the world, longitude is marked on the equator, and latitude on the circles that contain the two hemispheres. But in maps of particular countries, longitude is marked at the top and bottom, and latitude at the sides. The lines running from the top to the bottom of the map, that is, *north* and *south*, are MERIDIANS; and the lines which run from one side of the map to the other, that is, *east* and *west*, are PARALLELS. See the diagram, page 35.

GRAND OR GENERAL DIVISIONS OF LAND AND WATER.

Of the land on the earth's surface there are FIVE GREAT DIVISIONS,[d] namely, Europe, Asia, Africa, America, and Oceanica, which includes Australia and Polynesia. Europe, Asia, and Africa, are sometimes called the Old World, and sometimes the Eastern Con-

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[a] *Delta.*—This is the name of the Greek letter D, the shape of which is triangular (Δ).

[b] So called with reference to *the Archipelago.*

[c] *Lake.*—Large lakes in Ireland are called *loughs*, and in Scotland, *lochs*; as *Lough* Neagh, *Lough* Erne; *Loch* Katrine, *Loch* Leven. These terms are also applied to arms of the sea or bays; as the *Lough* of Belfast, *Lough* Ryan, &c.

[d] See page 153 for estimates of the extent of each of the great divisions of land.

tinent; while America is generally called the New World, or the Western Continent.

Of the water on the earth's surface there are also FIVE GREAT DIVISIONS, namely, the Pacific, the Atlantic, the Indian, the Arctic, and the Antarctic oceans.[a]

GEOGRAPHICAL TERMS ILLUSTRATED.

OCEANS.

The Pacific Ocean extends from the western shores of North and South America to the eastern coasts of Asia and Australia.

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[a] By looking on a map of the world, it will be evident that all these oceans communicate with each other, and that, strictly speaking, there is but one ocean or vast body of water which extends over nearly three-fourths of the earth's surface. Of these great divisions of water the Pacific is the largest, being about 8,000 miles from north to south, and 11,000 from east to west. The Atlantic is next in extent, being about 9,000 miles from north to south, and where broadest, from east to west, between 3,000 and 4,000 miles. The Indian Ocean is about 6,000 miles from north to south, and about 5,000 miles from east to west.

The *Pacific* was so called because it was erroneously supposed, when first discovered, to be free from storms; and contrasted with the Straits of Magellan and the adjoining seas, it well deserves its name. The *Atlantic* takes its name from Mount *Atlas* on the western coast of Africa; and the *Indian* Ocean, from *India* or *Hindostan*. The *Arctic* means the *north*, and the *Antarctic* *opposite* to the north.

As the *bottom* of the sea is doubtless like the *surface* of the earth (which was at a former period in the same position), it might be

The Atlantic Ocean extends from the eastern shores of North and South America to the western coasts of Europe and Africa.

The Indian Ocean lies to the south of Asia, the east of Africa, and the west of Australia.

The Arctic Ocean surrounds the north pole; and the Antarctic Ocean the south pole.

SUBDIVISIONS OF THE OCEANS.

Those parts of an ocean which approach or extend into the land are usually called seas, gulfs, bays, channels, or straits. Thus the Pacific Ocean, on its western side, forms the Sea of Kamtschatka, the Sea of Okhotsk, the Gulf of Tartary, the Sea of Japan, the Yellow Sea, the Chinese Sea, the Gulf of Tonquin, and the Gulf of Siam; and on its eastern side, the Gulf of California, and the Bay of Panama.

The principal branches of the Atlantic Ocean on its eastern side are, the Baltic Sea, the North Sea or German Ocean, the Bay of Biscay, the Mediterranean Sea, and the Gulf of Guinea; and on its western side, Baffin's Bay, Davis' Strait, Hudson's Strait, Hudson's Bay, Straits of Florida, Gulf of Mexico, and the Caribbean Sea.

The principal branches of the Indian Ocean are, the Bay of Bengal, the Gulf of Martaban, the Arabian Sea, the Gulf of Oman, the Persian Gulf, the Red Sea, and the Channel of Mozambique.

The principal branches of the Arctic Ocean are, the White Sea, the Sea of Kara, the Gulf of Obi, and Behring's Straits.

The Antarctic Ocean has no branches, because no part of it approaches any considerable tract of land.

CONTINENTS.

Four of the great divisions of land are called CONTINENTS, namely, Europe, Asia, Africa, and America. Continents are subdivided into COUNTRIES or NATIONS the inhabitants of which, generally speaking, differ in language, laws, customs, and manners.

The *political* divisions of the earth are Empires, Kingdoms, Grand Duchies, Duchies, Principalities, and Republics; which contain Cities, Towns, and Villages.

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inferred that the greatest depression of the bed of the ocean corresponds to the highest elevation of the earth's surface. If this were so, the greatest depth of the sea would be about five miles, which is about the elevation of the highest mountain in the world. It has been ascertained, however, that the depth of some parts of the bed of the ocean is much greater than this. In 1853, in lat. 36° 40′ S., and long. 36° 9′ E., Captain Denham, R.N., found the depth to be 46,236 feet, or, in other words, eight miles and three-quarters! The great extent of the bottom of the sea as compared with the surface of the dry land (nearly 3 to 1), should lead us to expect such a result.

The extent of each of the great divisions of water in millions of square miles is estimated as follows:—Pacific Ocean 50; Atlantic Ocean 25; Indian Ocean 20; Arctic and Antarctic Oceans, and Great Seas 50½. Total 145½. See page 154.

An EMPIRE consists of several countries united under one ruler, who is usually called an *emperor*.[a] A KINGDOM consists of one or more countries governed by a *king* or queen. GRAND DUCHIES, DUCHIES, and PRINCIPALITIES are small sovereignties governed by a *grand duke*, a *duke*, or a *prince*. A REPUBLIC is a country governed by a ruler elected by the people for a limited period. He is usually called a president.

MONARCH[b] and MONARCHY are other names for *king* and *kingdom*. A *limited* or *constitutional* monarchy is a government in which the power of the sovereign is restricted by the laws, usages, and institutions of the realm. An *absolute* or *despotic* monarchy is a government where the legislative and executive functions are administered by the sovereign without his being subject to the control of any legally constituted or representative public body, such as a PARLIAMENT. See note, page 199.

The POPULATION of the globe is estimated at upwards of one thousand millions. See page 154.

Of the population of the globe it is estimated that about two-sixths are Christians,[c] one-sixth Mahometans, and the remainder Pagans, except about 4½ millions of Jews.

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[a] The term *emperor* is derived from, and originally referred to the IMPERATOR of the Romans. The German emperors assumed the title as successors of Charlemagne, who was crowned Emperor of the West in the year 800; and the Czar (that is, the *Cæsar*) of Russia, and the Sultan of Constantinople affect it as if succeeding to the Roman Empire of the East. The term in itself implies greater power and more extensive sway than that of *king*; and hence it was assumed by Napoleon in 1804; and, for a similar reason, it has been assumed by his no less ambitious succes-or.

[b] *Monarch* is derived from the Greek words *monos*, one or alone, and *archō*, to govern.

[c] Hassel estimates the numbers attached to the different religions of the world as follows:—Pagans, 561,820,300; Christians, 252,565,700; Mohammedans, 120,105,000; Jews, 3,930,000.

The same author thus classes the different denominations of Christians:—Roman Catholics, 134,732,000; Greek Church, 56,011,000; Protestants, 55,791,700; Monophysites, 3,865,000; Armenians, 1,799,000; Nestorians, &c., 367,000.

Christianity is the religion of Europe and of European settlements in every part of the world. *Mohammedanism* prevails in the northern part of Africa, and the western parts of Asia. The *Jews* are more numerous in Poland than in any other country, but they are found in most of the principal cities of the world. *Paganism* is the religion of the populous countries of south-eastern Asia, and of savages in all parts of the world. Of Paganism there are various systems, but they all resemble each other in their absurdity, idolatry, and immorality.

EUROPE.

EUROPE is the smallest, but by far the most important and the most powerful of the great divisions of the globe. For the grandeur of its natural features it is the least distinguished; but in knowledge, civilization, and refinement, it surpasses all the others.[a]

It is bounded on the north by the Arctic Ocean, on the east by Asia, on the west by the Atlantic Ocean, and on the south by the Mediterranean, the Archipelago, the Sea of Marmora, the Black Sea, and (according to some geographers) the Caucasian Mountains.

Its length from the mouth of the river Kara, in the north-eastern extremity of Russia, to Cape Roca in Portugal, is nearly 3,400 miles; and its breadth from Nordkyn[b] in Finmark, to Tarifa Point in Spain, is about 2,400 miles.

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[a] See page 105 for a full description of the different races into which mankind has been divided; and add the following as the chief characteristics of the *Caucasian* race:—The Caucasian or European race have proved themselves superior to all the others in enterprise, energy, and courage. The inhabitants of every country and climate have felt and acknowledged their superiority, and the whole world seems destined, at no distant day, to come under their dominion. A great portion of the Old World is already subject to their sway, and the whole of the New Continent may be said to belong to them and their descendants. In the remote and multitudinous islands of the Pacific Ocean, the voices of their missionaries are heard; and their colonists are pushing their settlements over the barbarous and far distant continent of *Australia*.

But the Caucasian or European race have distinguished themselves from the other inhabitants of the world still more by the arts of peace—continued advancement in civilization—and successful cultivation of science and literature; and, in fact, it is to these studies, and to the results produced by them, that their superiority in arms is principally due.

The Caucasians of Europe are divided into three great families—the Celtic, the Gothic or Teutonic, and the Sclavonic. The Gothic is subdivided into the Scandinavian and German families. The former includes the Danes, Swedes, and Norwegians; and the latter, the Germans, the Anglo-Saxons, and the Dutch. Many of these races have more or less amalgamated, and their languages have been intermixed.

[b] *Nordkyn*.—The North Cape is in the island of Mageröe, and not in the mainland. Nordkyn means *North cape* or *head*. The root of *kyn* is the Celtic *cean* or *ken*, the *head*; as in *Ken*more, the *great* head; *Kin*naird, the head of the *heights*; *Can*tyre, the head of the *land*.

Europe lies between the parallels of 36° and 71° N.L.; and between the meridians of 9° 30′ W., and about 61° E.L.[a]

The AREA or superficial extent of Europe is estimated at upwards of 3½ millions of English square miles; and the POPULATION is now supposed to amount to nearly 270 millions. See page 154.

GENERAL DIVISIONS OF EUROPE.

The *north* of Europe consists of Lapland, Finland, the northern parts of Russia, Norway, Sweden, and Denmark.

The *north-east* of Europe is occupied by Russia, and the *south-east* by Turkey and Greece.

The *middle* regions of Europe comprise Austria, the German States, Switzerland; and towards the coast, France, Belgium, Holland, Hanover, and Prussia.

The *south* of Europe consists of three great projections or peninsulas, which comprise Spain and Portugal, Italy, Greece and Turkey.

To the *west* of Europe, are the British Islands, Great Britain or England and Scotland, and Ireland.

The *northern* countries of Europe lie, generally speaking, north of the parallel of 55°; the *middle* countries, between 55° and 45°; and the *southern* countries, to the south of the parallel of 45°.

GENERAL TEMPERATURE.

The climate of the NORTHERN countries of Europe is *cold* towards the north, and *temperate* towards the south.

The climate of the MIDDLE countries is *temperate* towards the north, and *warm* towards the south.

The climate of the SOUTHERN countries is *warm* towards the north, and *hot* towards the south.

The PRODUCTIONS of the northern, middle, and southern countrics of Europe vary with their CLIMATES. See page 315.

POLITICAL DIVISIONS.

The present political divisions of Europe amount to 58, namely, 4 empires; 15 kingdoms; 1 ecclesiastical state; 7 grand duchies; 11 duchies; 12 principalities; 4 republics; and 4 free towns.

The EMPIRES are Russia, Austria, France, and Turkey.

The KINGDOMS are Great Britain and Ireland, Prussia, Spain,

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[a] The north-eastern extremity of *European* Russia extends to about 68° east longitude.

Sweden and Norway, Holland, Belgium, Portugal, Naples and Sicily,* Bavaria, Sardinia, Denmark, Saxony, Wurtemberg, Hanover, and Greece.

The GRAND DUCHIES are Baden, Hesse-Darmstadt, Mecklenburg-Schwerin, Mecklenburg-Strelitz, Oldenburgh, Saxe-Weimar, and Tuscany,* including the Duchy of Lucca.

The principal DUCHIES are Nassau, Brunswick, Saxe-Coburg-Gotha,[a] and Modena* and Parma* (in Italy).

The REPUBLICS are, Switzerland, the Ionian Islands, San Marino (in Italy),[b] and Andorra,[b] (Pyrenees.)

The FREE TOWNS are Hamburg, Frankfort, Bremen, and Lubeck.

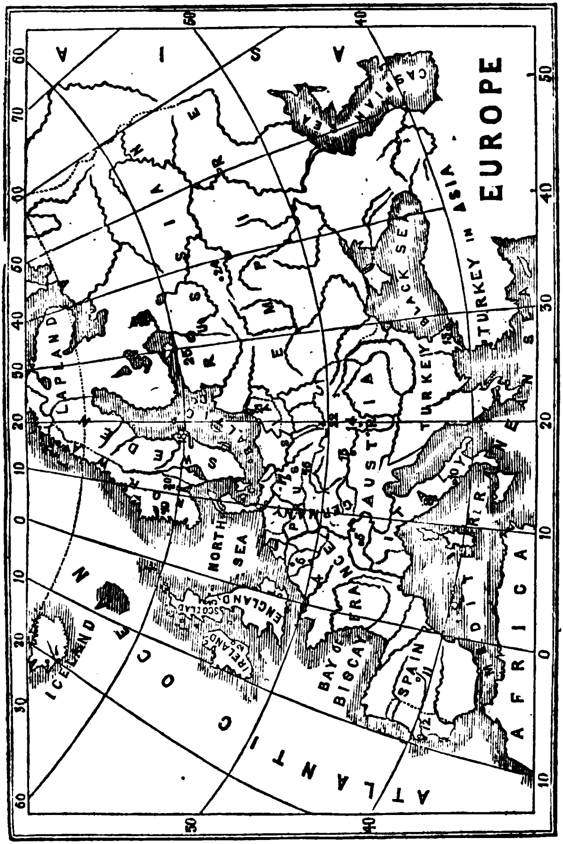
CAPITALS OF THE PRINCIPAL COUNTRIES IN EUROPE.

Countries.	Capitals.	Population.	Year.
England,	London,	2,803,034	1861
Ireland,	Dublin,	249,733	1861
Scotland,	Edinburgh,	168,098	1861
Denmark,	Copenhagen,	143,591	1855
Norway,	Christiania,	33,000	1855
Sweden,	Stockholm,	95,950	1855
Russia,	St. Petersburg,	532,241	1852
Poland,	Warsaw,	156,072	1856
Prussia,	Berlin,	451,871	1853
Austria,	Vienna,	579,457	1855
Holland,	Amsterdam,	260,037	1858
Belgium,	Brussels,	260,000	1856
France,	Paris,	1,727,419	1857
Switzerland,	Berne,	25,000	1850
Spain,	Madrid,	301,666	1857
Portugal,	Lisbon,	240,000	1854
Italy,	Rome,	178,798	1856
Turkey,	Constantinople,	715,300	1848
Greece,	Athens,	31,125	1853

* For the present it is thought better to make no change with regard to *Sicily*, *Tuscany*, *Parma*, and *Modena*. Their present *political* condition is well known.

[a] The other DUCHIES are Anhalt-Bernburg, Anhalt-Cothen, Anhalt-Dessau, Saxe-Altenburg, Saxe-Meiningen; and the PRINCIPALITIES are Hesse-Cassel (Electorate), Schwartzburg-Sondershausen, Schwartzburg-Rudolstadt, Reuss, Elder and Younger Branch, Lippe-Detmold, Lippe-Schaumburg, Hohenzollern-Hechingen, Hohenzollern-Sigmaringen, Waldeck, Lichtenstein, and Hesse-Homburg (Landgrave of).

[b] The small and primitive republics of San Marino and Andorra scarcely deserve to be mentioned as independent states. The population of the former is about 7,000, and of the latter about 18,000



References to the Map of Europe.

Amsterdam,	7	Christiania,	20	Hamburg,	9	Naples,	10
Bergin,	19	Constantinople,	13	Konigsberg,	21	Paris,	4
Berlin,	17	Cracow,	22	Lisbon,	12	Petersburg,	23
Berne,	4	Dresden,	16	London,	1	Rome,	8
Brussels,	6	Dublin,	2	Madrid,	11	Stockholm,	18
Buda,	14	Edinburgh,	3	Moscow,	24	Vienna,	15

CLASSIFICATION OF THE STATES OF EUROPE.

Great Britain, France, Russia, Austria, and Prussia, are called "the Five Great Powers of Europe."

Spain, Sweden with Norway, Turkey, and Sardinia, or the Kingdom of North Italy, are second-rate powers.

Holland, Belgium, Portugal, Naples, Bavaria, Denmark, Saxony, Wurtemberg, Hanover, and Switzerland, are third-rate powers; and the remainder are fourth-rate, or under.

RELIGIONS OF EUROPE.

Generally speaking, the Roman Catholic religion prevails in the south of Europe, the Protestant in the north, and the Greek Church in the north-east. In the middle countries of Europe there is a mixture of Protestants and Roman Catholics, as in the German States, &c. Mohammedanism is confined to Turkey and the extreme south of Russia. See note [b], page 191.

SEAS, GULFS, BAYS, AND STRAITS.

SEAS.—The principal seas of Europe are the Mediterranean, the Baltic, the North Sea or German Ocean, the White Sea, the Black Sea, the Archipelago, the Sea of Marmora, the Sea of Azov, the Irish Sea, the Skager Rack, and the Cattegat.

GULFS.—The Gulf of Venice, Genoa, Lyons, Taranto, and Lepanto or Corinth, in the Mediterranean; and the Gulf of Bothnia, Finland, and Riga, in the Baltic.

BAYS.—The Bay of Biscay, north of Spain, and west of France; the Bay of Naples; the Bay of Dublin.

CHANNELS.—The British Channel, St. George's Channel, the North Channel (north of the Irish Sea.)

STRAITS.—The Straits of Gibraltar, Bonifacio, and Messina, in the Mediterranean; the Straits of the Dardanelles, and Constantinople, connecting the Sea of Marmora with the Archipelago and Black Sea; the Straits of Kaffa or Yenikale, between the Black Sea and the Sea of Azov; the Straits of Dover; the Sound, and the Great and Little Belts which connect the Baltic with the Cattegat.

ISLANDS.—The principal islands of Europe are, Great Britain and Ireland; Sicily, Sardinia, Corsica, Elba, Majorca, Minorca, Iviza, Malta, and the Ionian Islands, in the Mediterranean; Negropont, and many others, in the Archipelago; Candia and Cyprus in the Levant Sea; the Azores in the Atlantic Ocean; Zealand, Funen, Gothland, &c., in the Baltic; Guernsey, Jersey, &c., in the British Channel; the Isle of Man; the Orkney and Shetland Isles; Iceland, Spitzbergen, and Nova Zembla.

PENINSULAS.—Spain and Portugal, called by way of eminence, the Peninsula; Norway and Sweden, Italy, the Morea, Jutland, and the Crimea.

ISTHMUSES.—The Isthmus of Corinth in Greece; and Perekop, which connects the Crimea with the mainland.

CAPES.—Nordkyn in Finmark; the North Cape in the island of Mageröe; the Naze, south of Norway; Cape Finisterre and Ortegal in Spain; Cape La Hogue in France; Cape St. Vincent in Portugal; Cape Spartivento in Italy; Cape Matapan in the Morea; Cape Clear in Ireland; and the Land's End in England.

MOUNTAINS.—The principal mountains in Europe are, the Alps, which divide Italy from Switzerland, Germany, and France; the Pyrenees, between France and Spain; the Apennines, which run down Italy; the Carpathian, north and north-east of Hungary; Hæmus or the Balkan Mountains, in Turkey; the Ural or Oural, between Europe and Asia; and the Dovre-field, between Norway and Sweden. The volcanoes or burning mountains are, Etna in Sicily, Hecla in Iceland, and Vesuvius in Italy.[a]

RIVERS.—The principal rivers of Europe are the Volga, flowing into the Caspian Sea; the Danube, Dnieper, and Dniester, into the Black Sea; the Don, into the Sea of Azov; the Rhine and the Elbe, into the North Sea; the N. Dwina, into the White Sea; the Vistula, Oder, and S. Dwina, into the Baltic; the Rhone, Loire, Garonne, and Seine, in France; the Tagus, Guadiana, and Ebro, in Spain; the Po and Tiber, in Italy; the Thames and Severn, in England; the Shannon, in Ireland; and the Tay and Clyde, in Scotland. [See page 97 for a classification of the principal rivers in the world.]

LAKES.—The principal lakes are, Ladoga and Onega in Russia; Wener, Wetter, Mæler, in Sweden; Geneva, Constance, and Neufchatel, in Switzerland; Garda, Como, and Maggiore, in Italy; Lough Neagh in Ireland; Loch Lomond in Scotland; and Windermere in England. [See pages 98 and 100 for a classification of the principal lakes in the world.]

PHYSICAL OR NATURAL FEATURES OF EUROPE.

Europe is distinguished from all the other great divisions of the globe by the irregularity of its shape or outline, and the consequent indentation of its coasts by seas, gulfs, and harbours.[b] With the exception of Switzerland and the Minor German states, every country in it has the advantage of a sea coast. This circumstance not only gives Europe peculiar facilities for commerce and navigation, but has also a beneficial effect upon its climate and natural products.

SURFACE.—About two-thirds of the surface of Europe consists of an immense plain with occasional elevations. The remainder is mountainous or hilly. The principal mountain ranges, with the exception of the Scandinavian chain, are in the south. [See page 79 for a descrip-

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[a] See page 79 for a description of the Mountains of Europe.

[b] Europe has 17,000 miles of *coast* LINE; Asia (which is about five times as large as Europe), has but 33,000; Africa (about three times as large as Europe), has only 16,000; and America (about four times as large as Europe), has but 31,000.

tion of the principal mountains in Europe. See also page 155, for a general view of the declivities and drainage of Europe, &c.]

CLIMATE.—Europe, with the exception of a small portion of its northern extremity, lies within the temperate zone, and is therefore not exposed to the extremes either of heat or cold. Its climate is therefore more agreeable, and better adapted to develop the physical and intellectual energies of man, than that of any of the other great divisions of the globe. Its climate is also improved by the great number of its seas,[a] gulfs, and bays; and by the absence of those circumstances which render America and Asia so much colder in the same latitude. [Refer to pages 56 and 57, for examples.]

MINERAL PRODUCTIONS.—Europe produces, in great abundance, iron, lead, copper, tin, quicksilver, coal, and salt,—minerals far more useful to man, and much more productive of wealth, than gold, silver, and precious stones. Nor—till the discoveries of the *gold regions* in California, Australia, and British Columbia—could it be considered deficient in its supply of the precious metals. The gold which it produces is equal to the amount formerly supplied by America. Of the whole quantity of gold produced in Europe, Russia, which also produces *platina* and *precious stones*, supplies six-sevenths, and Hungary and Transylvania nearly the remaining seventh.

Austria and Saxony produce a few *precious stones*, and *silver* in small quantities. *Silver* is also produced in small quantities in Hanover, Turkey, Prussia, England, France, &c.

Of the whole quantity of iron produced in Europe, England furnishes a third; Russia, a fourth; France, a fifth; and Sweden, a tenth. The Swedish and Russian iron is very superior in quality, and well adapted for the fabrication of steel. The iron for ordinary purposes in England is of an inferior description,[b] but the best English iron is nearly equal in value to the finest Swedish. Of the value of the whole mineral produce of Europe, iron, notwithstanding the slight intrinsic value of the metal, constitutes a third; while gold, silver, and platina, taken together, constitute only a ninth of that value.

Of the *lead* produced in Europe, Spain supplies nearly the one-half, and England three-sevenths.

Of the *tin*, England supplies about twelve-thirteenths, that is, nearly the whole;[c] and of the *copper*, more than the half. Of the remainder, Russia supplies a fifth, and Sweden and Norway a tenth.

Of the *coal*, England supplies sixteen times as much as France, and fifteen times as much as Belgium.

Quicksilver is found principally in the mines of Idria, in Illyria. It is also found in Spain and Bavaria.

Platina has been recently discovered in the Ural and Caucasian mountains. See page 88.

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[a] See the last paragraph of Chap. IX., p. 111; and note [b], p. 184.

[b] The British foundries produce five-sixths of the cast-iron consumed in Europe for the fabrication of machinery, culinary utensils, &c., the French about a tenth, and the Prussian scarce a fortieth. In Russia and Sweden few castings are made.

[c] The tin mines of England (in Cornwall), are as famed for their richness as for their great antiquity. See note [a], page 231.

Zinc, *cobalt*, *arsenic*, and nearly all the other minerals with which we are acquainted, are found within the limits of Europe.

Northern Italy yields the finest *statuary marble;* and the southern part of the same country, and Sicily, supply immense quantities of *sulphur*, *vitriol*, *sal-ammoniac*, and other volcanic products.

Nitre is found in great quantities in Hungary; and *salt* in almost every country in Europe. The salt mines of Wieliczka, near Cracow, are the most celebrated.

VEGETABLE PRODUCTS.—Refer to page 315 for a general description of the climates and productions of the earth.

ANIMALS.

QUADRUPEDS.—The number of wild animals in Europe is nothing when compared with those inhabiting the other great divisions of the globe, particularly Asia and Africa. The most formidable are the white bear, confined to the frozen regions, the brown bear, once common in England, but now found only in the Alps, Pyrenees, and other remote mountainous and wooded regions; the wolf, still inhabiting many parts of Europe, and the wild boar. Of the deer species, the elk and reindeer are found in the extreme north of Europe; and in some of the central countries, the red-deer and roebuck. In the Alpine regions, in the south, are found the chamois or wild goat, and the ibex. The other wild animals are the lynx, confined to the south of Europe; the wild cat, the fox, the otter, &c.

BIRDS.—The birds of Europe are much more numerous than the *mammalia*. Above 400 species are regular inhabitants, besides many occasional visitants. The northern regions are characterized by the multitudes of swimming and wading birds; and in the mountainous and rocky parts of those regions there are also enormous eagles, large owls, and other birds of prey.

In the central and southern regions are found the golden and imperial eagles; and four species of vultures inhabit the Alpine ranges.

On the shores of the Mediterranean there is an intermixture of the ornithology of Europe, Africa, and Asia; as the Balearic crane, pelican, flamingo, &c. The birds of Europe are not so distinguished by the brilliancy of their plumage as those of the tropical regions, but they excel them in the melody of their notes.

FISH.—In the northern seas, the whale, walrus, &c.; in the Mediterranean, the anchovy and tunny; in almost all the other seas of Europe, herring, salmon, cod, ling, haddock, &c., &c.

REPTILES.—The reptiles of Europe are few, and generally harmless. The common viper is the only venomous serpent.

RACES OF MEN.—The different races of men in Europe, as indicated by their languages, are the Celtic, the Gothic or Teutonic, the Græco-Latin, the Slavonic, the Ouralian or Finnish, and the Turkish or Tartar. See note, page 192.

GOVERNMENT.—The despotism of Asia and Africa is unknown in Europe, for even in those states which are under absolute monarchies,[a] the sovereigns are restricted by the laws, usages, and institutions, of their respective countries.

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[a] In no country in Europe, not even in Turkey, is there a really absolute monarch, that is, where the sovereign can say with safety—

"Sic volo, sic jubeo, stet pro ratione voluntas."

Under a *limited* or *constitutional* monarchy the subject enjoys the highest degree of rational liberty: and of this form of government the United Kingdom of Great Britain and Ireland affords the most perfect[a] specimen. The other countries in Europe under *constitutional* monarchies, but in a much less degree than Great Britain and Ireland, are Sweden and Norway, Denmark, Holland, Belgium, Hanover, Bavaria, Wurtemberg, Spain, Portugal, Greece, Prussia, and Sardinia.

The countries under *absolute* monarchies are Turkey, Russia, Austria, France (in reality), some of the minor German States, and until recently (1859), all the Italian States, except Sardinia.

The *republican* form of government prevails only in Switzerland, the Free towns (Hamburg, Frankfort, Bremen, and Lubeck), and in the small states of the Ionian Islands, San Marino, and Andorra.

THE BRITISH EMPIRE.

The British Empire consists of the United Kingdom of Great Britain and Ireland, and of extensive possessions and numerous colonies in every quarter of the world.

The island of Great Britain comprises England and Wales, or South Britain; and Scotland, or North Britain. Ireland lies to the west of Great Britain, and is sometimes called West Britain. Great Britain and Ireland, with the adjacent islands, are usually called the British Isles.

The British possessions are:—

In Europe.—Heligoland, a small island in the German Ocean, about thirty-six miles from the mouths of the Elbe and Weser; Gibraltar, an important fortress in the southern extremity of Spain, commanding the entrance to the Mediterranean; and Malta, an important and celebrated island in the Mediterranean, to the south of Sicily, with the small islands of Gozo and Cumino.

In Asia.—The greater part of India or Hindostan, and the large and important island of Ceylon, near the south-eastern extremity of it. And in the Eastern or Indo-Chinese peninsula, the extensive and valuable territories or provinces of Assam, Aracan, Pegu, and Tenasserim; a portion of the peninsula of Malacca, which, with the islands of Penang and Singapore, forms "the Straits' Settlement;" and the island of Hong-Kong at the entrance of the Canton river. To these may be added Aden, an important town and stronghold in Arabia, which commands the entrance of the Red Sea; and the island of Labuan, near the entrance of the Borneo river.

In Africa.—The important and flourishing colony of the Cape of Good Hope, or, as it is usually called, the Cape Colony; the adjoin-

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[a] The most distinguished foreign writers on the subject of civil government, including *Montesquieu* and *De Lolme*, have given it as their opinions, that in no part of the world is liberty so well understood, and so perfectly enjoyed, as under the British constitution.

ing and extensive colony of Natal;[a] Sierra Leone, Cape Coast Castle, and other settlements and forts on the Gold Coast, and the Gambia. Also the Islands of Ascension, St. Helena, the Mauritius or Isle of France, and a few others of minor importance.

IN NORTH AMERICA.—The great and flourishing colony of Canada, with the island of Anticosti; New Brunswick; Nova Scotia with Cape Breton Island; Prince Edward's Island; and Newfoundland; also Hudson's Bay Territory and Labrador. To which is to be added the new and important colony of British Columbia, including Vancouver's Island; also Belize or British Honduras; and the Bermudas or Somers' Islands.

IN SOUTH AMERICA.—British Guiana, comprising Demerara, Essequibo and Berbice; and the Falkland Islands.

IN THE WEST INDIES.—The Bahamas or Lucayos Islands; Jamaica, Barbadoes, Trinidad, and several other important islands.

IN AUSTRALIA.—New South Wales, Queensland, Victoria, South Australia, Western Australia, Tasmania or Van Diemen's Land, New Zealand, and Norfolk Island.

PROTECTED STATES.—The Ionian Islands in Europe, and several States in India are under the protection of the British Crown.

EXTENT AND POPULATION OF THE BRITISH EMPIRE IN EUROPE.

BRITISH ISLANDS.	Extent in sq. miles.	Population. 1831.	1841.	1851.	1861.
GREAT BRITAIN:					
England,	50,387	13,091,005	14,995,138	16,783,947	20,061,725
Wales,	7,425	806,182	911,603	1,188,821	
Scotland,[b]	31,167	2,365,114	2,620,184	2,870,784	3,061,251
IRELAND,	32,512	7,767,401	8,175,124	6,515,794	5,764,543
Isle of Man,	220	41,000	47,975	52,116	52,339
Guernsey, &c.	50	26,128	28,521	33,645	29,846
Jersey,	62	36,582	47,544	57,155	56,678
ARMY, NAVY, &c.,		277,017	188,453	167,604	[c]275,900
Total of United Kingdom,	121,823	24,410,429	27,019,558	27,614,866	29,302,282

[a] The coast of *Natal* was so named by Vasco de Gama, because it was discovered by him on Christmas day (the day of the *Nativity*).

[b] This includes the Scottish Islands. The area of Scotland itself is 26,014 square miles.

[c] Such part of the Army, Navy, and Merchant Seamen, as were on shore within the United Kingdom, on the night when the Census was taken, are included in this enumeration.

The AREA of the United Kingdom of Great Britain and Ireland may be estimated at about 122,000 square miles; and the present POPULATION at about 30 millions.

The AREA of the Colonies and Foreign Possessions of the British Empire in various parts of the globe may be estimated at upwards of 7 millions of square miles; and the POPULATION at about 180 millions. Hence, about a *seventh* of all the land on the SURFACE of the earth, and about a *sixth* of its entire POPULATION, are under the sovereignty of the British Crown. Or, in other words, Great Britain rules over a territory *sixty* times as large as itself, and over a population *six* times as numerous as her own. In fact, the sun never sets upon the dominions of England. Her ships traverse every sea; and in every harbour in the world her flag is seen.

REVENUE.—The annual revenue of the British empire amounts to about £100,000,000.[a] This includes the revenue of British India, which is above £30,000,000 a year.

The ordinary revenue of the United Kingdom alone is about £66,000,000 a-year; that is, it is equal to more than a fourth of the sum total of the revenues of all the States of Europe.

The revenue is derived principally[b] from taxes on tea, sugar, tobacco, malt, hops, spirits, wines, stamp duties, property and income tax, land and assessed taxes, house duty, paper duty, legacy and succession duty.

NATIONAL DEBT.[c]—The national debt amounts to nearly £800,000,000; that is, to more than half of the sum total of all the States of Europe. But the national PROPERTY exceeds, it is estimated, £3,700,000,000; and if colonial property be included, it amounts to upwards of £5,500,000,000. The national INCOME, or the produce of all kinds of industry and property, is estimated at upwards of £500,000,000 a-year.

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[a] The revenue of the financial year ending 31st March last (1860) was £71,089,668.

[b] Of the whole revenue, the Customs produce more than a *third;* the Excise more than a *fourth;* Stamps, almost an *eighth;* and the Income Tax at present, about another *eighth.* (In 1858, the amount of Income Tax raised in Great Britain was £7,306,689; and for the same year, in Ireland, the amount was £599,436).

[c] *National Debt.*—In times of war, the expenditure of a nation always exceeds its income or revenue; and hence, in order to carry it on, the government is obliged to borrow money at so much per cent. from those individuals of the community who are able and willing to lend it. The interest of the money so borrowed is paid out of the taxes or annual revenue of the country; and the persons who are entitled to receive it are called government creditors or *fundholders.* Hence the origin of the *National Debt.* At present it requires about 28 millions a year to pay the interest of the debt which has been contracted by the *nation* in this way; and it is obvious that if we had not this annual sum to pay, the taxes of the country would be little more

IMPORTS.—The annual value of the goods and merchandise imported into the United Kingdom of Great Britain and Ireland is between 160 and 170 millions sterling[a].

The principal imports consist either of materials for our manufactures, as raw cotton, wool, raw silk, flax, hemp, hides, tallow, timber, dye-stuffs, &c.; or of articles of food and consumption, as tea, sugar, coffee, tobacco, spirits, wines, corn, flour, oils, spices, &c. *Guano* now forms a large item in the value of our imports. It is largely used in agriculture, and to a small extent in manufactures.

EXPORTS.—The annual value of the goods and merchandise exported from the United Kingdom of Great Britain and Ireland is upwards of 130 millions sterling.[a]

The exports consist chiefly of manufactured goods, metals, and coals. The principal are cotton goods,[b] woollen goods, hardware, cutlery, steam-engines, and machinery of every kind, leather, silk goods, linen, glass, earthenware, beer, and ale.

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than half what they are at present; and almost every thing which we use or consume would be cheaper in proportion. What an argument this is against war—irrespective of the other and far greater evils which it necessarily produces!

To the continental wars in which England was engaged during the reign of William III., we owe the first foundations of the National Debt. At his death, in 1702, the whole amount was £16,394,000; but from that period it continued to increase, and from the same causes. At the commencement of the war with our American Colonies it had increased to £128,583,636. That war cost us upwards of £121,000,000. At the commencement of the war with Revolutionary France, in 1793, the amount of the National Debt was £233,733,609; and at the termination of it in 1815, it was £864,822,438. At the former period (1793), the revenue or national income was £31,978,674, and the expenditure £28,032,953; and at the latter period (1815), the revenue was £180,496,362, and the expenditure £165,202,924. At the commencement of the war with Russia in 1855, the amount of the National Debt was £793,375,199; and it is now (1858), £804,445,483.

[a] The total value of the IMPORTS in the year 1858 was £164,583,832, of which £125,970,832 was from foreign countries, and £38,613,500 from the British colonies. The total value of the EXPORTS for the same year was £139,782,779, of which £116,608,756 represented the value of the productions of the United Kingdom, and £23,174,023 that of foreign and colonial countries re-exported. The imports and exports for the year 1858, therefore, represented a gross total trade on the part of the British Empire of upwards of 300 millions sterling.

[b] In 1859 the total value of the exports from Great Britain amounted to £130,513,185, of which £47,920,720 consisted of cotton goods. Hence more than *one-third* of the value of our entire exports consists of cotton goods; and this does not include the proportion of cotton which forms part of 12 millions more exported in the shape of mixed woollens, haberdashery, millinery, silks, apparel, and slops. This cotton in a raw state cost us about £30,000,000; and besides the 50 millions' worth which we exported in a manufactured state, we retained 24 millions'

British Army.—The regular army amounts to about 220,000 men; the militia, yeomanry, and pensioners, to about 130,000, and the volunteers to upwards of 130,000. This important force, *the cheap defence of nations*, is increasing daily.[a]

British Navy.—The British navy consists of upwards of 700 vessels of war of all classes, carrying upwards of 18,000 guns, and about 80,000 seamen and marines.

British Shipping.—The number of merchant and trading vessels belonging to the United Kingdom of Great Britain and Ireland is upwards of 28,000, of which more than 2,000 are steam vessels. The number of tons which these vessels carry is above 4,600,000; and the number of seamen employed in navigating them is upwards of 220,000.[b] And if the shipping belonging to the British Colonies

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worth for home consumption. The importance of the cotton trade, therefore, cannot be overrated. At present, upwards of 500,000 workers are employed in our cotton factories; and it has been estimated that at least *four millions* of the population of Great Britain are dependent upon this trade for their subsistence. In connexion with this, it should be added, that we are dependent upon the United States of America for *five-sevenths* of the whole quantity of the raw cotton which we require for our manufactures.

[a] The British army, at the close of the Revolutionary war with France, in 1815, amounted to upwards of 450,000 men, including militia and volunteers; and the navy to more than 1,100 vessels, of which 256 were ships of the line. The following is the British naval force at present (1859):—*Sailing Vessels*—35 line-of-battle ships, 70 frigates, 43 corvettes, 15 brigs, 45 mortar vessels, 40 mortar floats. *Steam Vessels*—50 line-of-battle ships, 9 block ships, 34 frigates, 4 mortar vessels, 73 corvettes, 53 gun vessels, 8 floating batteries, 161 gun boats. Total, 640 vessels, of which 392 are worked by steam.

[b] In the year ending the 31st December, 1858, the number of merchant or trading vessels registered in the various ports of the British Islands, with the amount of their tonnage, was as follows:—

United Kingdom.	Sailing Vessels.	Tonnage.	Steam Vessels.	Tonnage.	Crews.
England and Wales, .	19,421	3,344,606	1,447	330,575	168,603
Scotland, .	3,229	367,829	314	84,846	32,862
Ireland, .	2,092	224,411	155	35,626	14,298
Total, .	24,742	3,936,846	1,916	451,047	215,763

If the shipping belonging to the Isle of Man, the Channel Islands, and the Colonies, at the same date be added, the total would be 35,512 sailing vessels, 2,239 steamers, 5,609,623 tons, and 288,345 seamen.

be added, the aggregate will be upwards of 38,000 vessels; 5,700,000 tons; and 290,000 seamen.

MINERAL PRODUCE.—In mineral and metallic wealth Great Britain is without a rival. The most valuable and the most important productions of her mines are coal, iron, copper, lead, and tin.

The total value of the coal, metalliferous minerals, and metals produced annually in the United Kingdom is upwards of 33 millions sterling, of which COAL constitutes considerably more than *a-half*, and IRON more than *a-third*.

AGRICULTURAL PRODUCE.—The value of the agricultural produce of the United Kingdom is estimated at about 200 millions sterling.

ENGLAND AND WALES.

ENGLAND is bounded on the north by the river Tweed, the Cheviot Hills, and the Solway Frith, which divide it from Scotland; on the south by the English or British Channel; on the east by the German Ocean; and on the west by St. George's Channel and the Irish Sea.

It lies nearly between the parallels of 50° and 56° north latitude, and between about two degrees of east, and six of west longitude.[a] Its length from the coast of Dorsetshire to Berwick-on-Tweed, is about 360 miles; and its breadth from St. David's Head, in Pembrokeshire, to Lowestoft, in Suffolk, is about 300 miles. Its AREA is estimated at 57,812 square miles, or 37,094,400 acres. The POPULATION of England and Wales, amounted in 1851, to nearly 18 millions, of which little more than one million belonged to Wales. It is now nearly 20 millions.[b]

England is divided into forty COUNTIES or SHIRES, and Wales into twelve, which, with the principal towns, are as follow:—

SIX NORTHERN COUNTIES OF ENGLAND.

Counties.	*Principal Towns.*
Northumberland,[c]	Newcastle, Berwick, Alnwick.
Cumberland,	Carlisle, Whitehaven, Penrith.
Westmoreland,[d]	Appleby, Kendal.
Durham,	Durham, Sunderland, Stockton.
Yorkshire,	York, Leeds, Sheffield, Hull.
Lancashire,	Liverpool, Manchester, Lancaster.

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[a] Accurately, between 1° 45′ east, and 5° 44′ west longitude.

[b] The last census (1861) exhibits an increase of about 12 per cent. for England and Wales, and of 6 for Scotland; but a *decrease* for Ireland of about 12 per cent.

[c] Northumberland, that is, the *land north of the Humber*. The kingdom of Northumberland, during the Heptarchy, extended from the Humber to the Frith of Forth.

[d] Westmoreland, that is, the *west moorland*.

FOUR ADJOINING WALES.

Counties.	*Principal Towns.*
Cheshire,[a]	Chester, Stockport, Macclesfield.
Shropshire, ...	Shrewsbury, Ludlow, Bridgenorth.
Herefordshire, . . .	Hereford, Leominster, Ledbury.
Monmouthshire, . . .	Monmouth, Chepstow, Abergavenny.

TEN NORTH-MIDLAND.

Nottinghamshire, . . .	Nottingham, Newark, Mansfield.
Derbyshire, ...	Derby, Chesterfield, Ashbourne.
Staffordshire, . . .	Stafford, Lichfield, Wolverhampton.
Worcestershire, . . .	Worcester, Dudley, Kidderminster.
Warwickshire,[b] . . .	Birmingham, Warwick, Coventry.
Leicestershire, . . .	Leicester, Loughborough.
Rutlandshire,[c] . . .	Oakham, Uppingham.
Northamptonshire, . . .	Northampton, Peterborough.
Huntingdonshire, . . .	Huntingdon, St. Ives, St. Neot's.
Cambridgeshire, . . .	Cambridge, Ely, Newmarket.

TEN SOUTH-MIDLAND.

Gloucestershire, . . .	Bristol, Cheltenham, Gloucester.
Oxfordshire, ...	Oxford, Woodstock, Henly, Banbury.
Buckinghamshire, . . .	Aylesbury, Buckingham, Wycombe.
Bedfordshire, ...	Biggleswade, Bedford, Dunstable.
Hertfordshire, ...	Hertford, St. Albans, Ware.
Middlesex,[d]	London, Westminster, Uxbridge.
Surrey, ...	Southwark, Guildford, Kingston.
Berkshire, ...	Reading, Windsor, Abingdon.
Wiltshire, ...	Salisbury, Devizes, Marlborough.
Somersetshire, . . .	Bath, Taunton,[e] Bridgewater.

FOUR EASTERN.

Lincolnshire, ...	Boston, Lincoln, Stamford.
Norfolk,[f]	Norwich, Yarmouth, Lynn,
Suffolk, ...	Ipswich, Bury St. Edmond's, Sudbury.
Essex, ...	Colchester, Chelmsford, Harwich.

[a] Cheshire for *Chester*shire. *Chester* derives its name from the Latin term *castra*, an encampment or fortified place. Hence also the frequent terminations in English towns; as in *Doncaster*, that is, the fortification on the *Don*, *Colchester*, on the *Colne*; *Lancaster*, on the *Lune*; *Exeter* (for *Execester*) on the *Exe*; *Rochester*, on the rock (*roche*).

[b] Warwick, that is, the *town* where the munitions for *war* were kept; the termination *wick* being from the Latin *vicus*, a street or town. Hence Nor*wich*, the *north town*, Green*wich*, Sand*wich*, Middle-*wich*, Aln*wick*, (on the *Aln*), Ips*wich* (on the *Gipping*, a tributary of the Orwell), &c.

[c] Rutland, that is, *red land*, for which this shire is still noted.

[d] Middlesex, that is, *middle Saxons*, with reference to ESSEX, or *East Saxons*; SUSSEX, or *South Saxons*; and WESSEX, or *West Saxons*. *Wessex*, the name of which no longer remains, though the most powerful kingdom of the heptarchy, comprised the counties to the *west* of Middlesex and Sussex, namely, Hampshire, Berkshire, Dorsetshire, &c.

[e] *Taunton*, that is, the Town on the *Tone*.

[f] Norfolk, that is, the *north folk* or people with reference to *Suffolk*,

SIX SOUTHERN.

Counties.	*Principal Towns.*
Kent,	Canterbury, Maidstone,[a] Dover.
Sussex,	Chichester, Brighton, Lewes.
Hampshire,	Portsmouth, Winchester, Southampton.
Dorsetshire,	Dorchester, Weymouth, Poole.
Devonshire,	Exeter, Plymouth, Devonport.
Cornwall,	Launceston, Falmouth, Truro.

THE COUNTIES OF WALES.

SIX IN NORTH WALES.

Flintshire,	Holywell, Mold, St. Asaph.
Denbighshire,	Wrexham, Denbigh, Ruthin.
Caernarvonshire,	Caernarvon, Bangor, Conway.
Anglesey,	Beaumaris, Holyhead.
Merionethshire,	Dolgelly, Bala.
Montgomeryshire,	Welshpool, Montgomery, Newton.

SIX IN SOUTH WALES.

Radnorshire,	New Radnor, Presteigne.
Cardiganshire,	Carden, Aberystwith.
Pembrokeshire,	Pembroke, Haverfordwest, Milford.
Caermarthenshire,	Caermarthen, Llanelly.
Brecknockshire,	Brecknock or Brecon, Hay.
Glamorganshire,	Cardiff, Swansea, Llandaff.

ISLANDS.—Anglesey, in North Wales; the Isle of Man, in the Irish Sea, at nearly equal distances from England, Ireland, and Scotland; the chief towns of which are Douglas, Ramsey, Castletown, and Peel. The Isle of Wight, south of Hampshire, remarkable for its fertility and beauty; Guernsey, Jersey, Alderney, and Sark, near the coast of France; Sheppey Island to the north, and Thanet to the north-east of Kent; Farn or Fern islands, Coquet, and Holy Island or Lindisfarne, near the coast of Northumberland; the Scilly Isles, south-west of Cornwall; and Lundy Island, in the Bristol Channel.

SAND BANKS.—Dogger Bank, in the German Ocean, between the Yorkshire coast and Jutland; Goodwin Sands, on the east of Kent.

CAPES.—Flamborough Head[b] and Spurn Head, in Yorkshire; North and South Forelands, and Dungeness, in Kent; Beechy Head, and Selsey Bill, in Sussex; Needles, on the west of the Isle of Wight; St. Alban's Head, and Portland Point, in Dorsetshire; Start Point, and Hartland Point, in Devonshire; Lizard Point, and Land's End, in Cornwall; Worm's Head, in Glamorganshire; St.

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which means the *south folk.* Compare also the derivations of *Norwich*, (the north town), and *Sudbury* (the south town).

[a] *Maidstone* is a contraction of *Medway's town.*

[b] Flamborough Head.—A cliff nearly 500 feet high, on which *beacon* fires used to be kindled; and hence it derived its name (*flame* borough). It still deserves its name, as it is the site of a modern light-house.

David's Head, and St. Goven's Head, in Pembrokeshire; Holyhead, in Anglesey; Great Orme's Head, in Denbighshire; St. Bee's Head, in Cumberland.

Bays.—On the *east* coast, Bridlington Bay; Humber Mouth; the Wash; Yarmouth Roads; Mouth of the Thames; the Nore; the Downs, between the coast of Kent and the Goodwin Sands.

On the *south* coast, Spithead; Southampton Water; Poole Harbour; Torbay; Mount's Bay; Falmouth Harbour.

On the *west* coast, Bristol Channel and Mouth of the Severn; Swansea Bay; Caermarthen Bay; Milford Haven; St Bride's Bay; Cardigan Bay; Caernarvon Bay; Menai Frith; the Estuaries of the Dee, the Mersey, and the Ribble; Morecambe Bay; Solway Frith.

Mountains.—The principal mountains are—the *Cheviot*[a] Hills, between Northumberland and Scotland; the *Pennine* or *Cumbrian* range, which extends from the western extremity of the Cheviot Hills to the middle of Derbyshire, through the eastern parts of Cumberland, Westmoreland, and Lancashire, and the western portions of Northumberland, Durham, and Yorkshire. The highest mountains of this range are—Skaw Fell,[b] Skiddaw, Bowfell, Cross Fell, Saddleback, in Cumberland; Helvellyn, between Cumberland and Westmoreland; Whernside, Ingleborough, and Pen-y-gant, in Yorkshire; and the Peak in Derbyshire.

The *Cambrian* range extends through the middle of Wales, from north to south, from which several spurs are thrown off, both towards the sea coast and the English counties adjoining. Its highest summits are Snowdon[c] and Llewellyn, in Caernarvonshire; Cader Idris and Arran Fowdy, in Merionethshire; Vann or Beacons, in Brecknockshire: and Plynlimmon, between Montgomery and Cardiganshire.

The *Devonian* range extends from the Bristol to the British Channel, through the west of Somersetshire, Devonshire, and Cornwall. The highest summits of this range are—Dunkerry Beacon, on Exmoor; Cawsand Hill,[d] Rippin Tor, Butterton, on Dartmoor; and Brown Willy, in Cornwall.

To these may be added the Malvern Hills in Worcestershire; the Wrekin in Shropshire; the Mendip Hills in Somersetshire; the Chiltern Hills, in Buckinghamshire and Oxfordshire; and the Cotswold Hills in Gloucestershire.

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[a] *Cheviot* Hill is 2,658 feet high.

[b] *Skaw Fell*, which is the highest in the range, is 3,166 feet high; *Helvellyn*, 3,055 feet; *Skiddaw*, 3,022; and the others mentioned, between 3,000 and 2,000 feet, except the High Peak, which is 1,981.

[c] *Snowdon* is 3,571 feet high; *Llewellyn*, 3,469; and the others nearly 3,000 feet, except Plynlimmon, which is 2,463.

[d] Cawsand Hill is 1,782 feet high; Dunkerry Beacon, 1,668; Rippin Tor, 1,549; Brown Willy, 1,368; and Butterton, 1,203 feet.

TABLE-LANDS.—The principal table-lands are Salisbury Plain in Wiltshire, and Dartmoor in Devonshire.

PLAINS AND VALLEYS.—The principal plains and valleys are the York Plain, the Cheshire Plain, the Central Plain, the District of the Fens, the Eastern Plain, the Valley of the Thames, and the Valley of the Severn.

The *York Plain*[a] lies between the Pennine range on the west, and the Wolds of Yorkshire and Lincolnshire on the east; and from south to north, it extends from the Trent to the mouth of the Tweed, a distance of upwards of 160 miles. Its greatest breadth is about 45 miles (under the parallel of the Humber).

The *Cheshire* or *Shropshire Plain* lies between the Pennine and the Cambrian ranges.

The *Central Plain*, generally speaking, is bounded by the Thames on the south, by the Trent on north, by the Severn on the west, and by the Ouse on the east.

The district called *the Fens* lies around the shores of the estuary of the Wash.[b] It is the lowest, and most level part of England. A large portion of it has been converted by drainage into highly productive land; but it still contains, particularly in the western part of it, several shallow lakes or *meres*. The largest, Whitlesea Mere, is 2½ miles long by 1½ broad.

The *Eastern Plain* extends from the Chiltern Hills on the west to the German Ocean on the east.

PRINCIPAL RIVERS.—Rivers flowing into the *German Ocean*:—The Tyne, Wear, Tees, Humber, (formed by the Trent, Ouse,[c] and other rivers,) Witham, Welland, Nen, Great Ouse, Yare, Stour (Essex), Orwell, THAMES, Stour (Kent), Medway, &c.

Into the *Irish Sea*.—The Mersey, Ribble, Eden, &c.

Into the *Bristol Channel*.—The Severn, Wye, Avon,[d] &c.

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[a] *York Plain*.—The great coal-field of Durham and Northumberland (upwards of 700 square miles in area), occurs in the northern portion of it; and in the southern part of it is the equally, and perhaps more extensive coal-field of Leeds and Nottingham.

[b] The Fens comprise parts of the counties of Lincolnshire, Northamptonshire, Huntingdonshire, Cambridgeshire, Norfolk, and Suffolk; and a large portion of the district is called the Bedford Level, from an Earl of *Bedford*, who, in the time of Charles I., formed a company for the purpose of draining it.

[c] *Ouse*.—This is another form of the word *ooze*, which is formed from the French EAUX, *waters*, like the term BEAUX, which is pronounced similarly, except in its vulgar form *bucks*. This explains why there are so many rivers of this name—as the Yorkshire Ouse, the Great and Little Ouse, and the Sussex Ouse; the term originally signifying the *water* or *waters*; as we say Derwent *Water*, the Black *Water*, &c. The Yorkshire Ouse is formed by the junction of the Swale and the Ure or Yore; and it afterwards receives the Nidd, the Wharfe, the Derwent, the Aire, and the Don.

[d] In the same way, the *Irish* or Celtic word *avon*, which signifies *water* or river, came to be the proper name of several rivers; as the

Into the English or *British Channel.*—The Salisbury or South Avon, Wey, Exe,[a] Tamar, Plym, Frome, &c.

LAKES.—Derwent Water or Keswick Lake, in Cumberland; Ullswater, between Cumberland and Westmoreland; Windermere, between Westmoreland and Lancashire; and Coniston Water, in Lancashire.

These lakes are insignificant as to size, but they are justly celebrated for the picturesque beauty of their scenery. They are situated amid the highest mountains in England.

PRINCIPAL TOWNS.—*London*, the capital of England, is the largest, richest, and most populous city in the world. Including the suburbs it is nearly 10 miles long by 7 broad, and its buildings cover an area of nearly 60 square miles. It is, in fact, as it has been called, "a province covered with houses." Its population amounts to nearly two millions and a-half; and for trade and commerce, wealth and magnificence, science and literature, it is the first city in the world.

Liverpool is next to London in commerce and wealth. It is the great emporium of the American, West Indian, and Irish trade, for which it is favourably situated, and to which its importance is principally due. Its docks, which are crowded with shipping, are upwards of four miles in length. Liverpool may be considered as the port of Manchester, from which it is 31 miles distant. Its population in 1851 was 375,955, and it is now nearly 450,000. Next in importance, as *shipping* and *commercial* towns, are Hull, Southampton, Bristol, Newcastle-upon-Tyne, Sunderland, Stockton, Yarmouth, Plymouth, Falmouth, and Dover.

The other principal ports are—on the *east* coast, Berwick, Whitby, Scarborough, Bridlington, Goole, Grimsby, Boston, Lynn, Lowestoft, Ipswich, Harwich, Colchester, Rochester, Faversham, Margate, Ramsgate, and Deal.

On the *south* coast—Folkestone, Rye, Hastings, Brighton, Shoreham, Cowes, Poole, Weymouth, Exeter, Dartmouth, Fowey, and Penzance.

On the *west* coast—St. Ives, Padstow, Bideford, Barnstaple, Ilfracombe, Bridgewater, Gloucester, Chepstow, Newport, Cardiff, Swansea, Milford, Cardigan, Aberystwith, Holyhead, Beaumaris, Chester, Birkenhead, Fleetwood, Lancaster, Ulverston, Whitehaven, Workington, Maryport, and Carlisle.

Stratford Avon, the Bristol Avon, the Salisbury Avon, and the Avon or *Nen*, in Northamptonshire.

[a] From the Irish or Celtic, or—which is the same thing—the ancient British word UISGE, *water*, several rivers derive their names in a similar way; as the *Esk*, the *Exe*, the *Axe*, and the *Usk*, in Wales. In Scotland, too, there are several *Esks*. In a similar way, the term DON has been applied to several rivers; as in Russia, to the *Don*, the N. and S. *Duna* or Dwina, the Dnieper, (that is, *Don*ieper, or *upper river*), and the Dniester, (*Don*iester, or *lower river*). The *Doon* and *Deen*, as in Aber*deen*, are evidently other forms of the same word.

Manchester is the second city for population, and the first for manufactures. It is the great centre of the cotton trade, for which England is unrivalled. Its manufactures of machinery, carpets, and silk, are also very extensive. Its population in 1861 (including Salford), was 460,018.

The other towns in which the *cotton* manufacture is extensively carried on are Oldham, Bolton, Ashton, Preston, Blackburn, Bury, Middleton, Burnley, and Chorley, all in Lancashire—Stockport, Hyde, and Duckinfield in Cheshire; and Glossop in Derbyshire.

Birmingham, celebrated for the great variety, extent, and excellence of its *metallic* manufactures, is the fourth city in England. Its manufactures comprise almost every description of metal work, from the smallest article to the most ponderous machinery. Its population in 1861 was 295,955.

Its principal manufactures are iron and steel goods, brass and iron founding, fire-arms, cutlery, tools, steam-engines, and all kinds of machinery, plated goods, or-molú, *papier-mâché*, and japanned wares, buttons, steel pens, trinkets, toys, glass, and saddlery. It is computed that these manufactures give employment to upwards of 20,000 families; and the annual value of them is upwards of four millions sterling.

Next to Birmingham, *Sheffield* is distinguished for the manufacture of cutlery, hardware, and plated goods. Dudley, Wolverhampton, Walsall, Wednesbury, West Bromwich, and Bilston, are also noted for the manufacture of iron and hardware.

Leeds, the chief seat of the woollen manufacture, is next to Birmingham in population and importance. Bradford,[a] Halifax, Huddersfield, and other towns in the West Riding of Yorkshire, are also extensively engaged in the manufacture of woollen goods. Also Rochdale in Lancashire, and Stroud in Gloucester. The latter is the chief seat of the West of England woollen manufactures.

The other great manufacturing towns are Nottingham, noted for *hosiery* and *lace*; Leicester also for hosiery, particularly for *woollen stockings*; Macclesfield for *silks*; also Derby, particularly for *silk stockings*; Coventry also for silks, particularly for *ribbons*; Norwich for *crapes*; Northampton for *shoes*; Kidderminster for *carpets*; Worcester for *porcelain* and *gloves*; Newcastle-under-Lyne for *pottery*; and Gloucester for *pins*.

Portsmouth, on Portsea Island, is distinguished for its fortifications and fine harbour, which is capable of receiving the whole British navy at once; it is the chief *naval* station of Great Britain. *Plymouth*, at the mouth of the Plym, with its gigantic *Breakwater*, is the second. Devonport, Chatham, Sheerness, Woolwich, and Deptford, are distinguished for their extensive *dock-yards*; and Spithead and the Nore are the principal *roadsteads* of the British navy.

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[a] In Bradford the raw material is chiefly converted into stuffs and worsted fabrics of various kinds.

Canterbury and *York* are distinguished for their great antiquity and magnificent cathedrals; and *Oxford* and *Cambridge* for their celebrated universities and architectural beauties, particularly Oxford, which has been called a city of palaces. *Windsor* is distinguished for its magnificent castle, the ancient and favourite residence of the sovereigns of England. *Bath* is the most beautiful city in England, and has long been celebrated for its medicinal springs. The other *watering* places of note are, Cheltenham, Leamington, Malvern, Matlock, Buxton, Harrogate, Tunbridge-wells, and Clifton. And the places chiefly resorted to for *sea-bathing* are Brighton, Scarborough, Ryde, in the Isle of Wight, Hastings, Weymouth, Ramsgate, Margate, and Redcar.

Merthyr-Tydvil, the largest town in Wales, though only a village in the last century, is distinguished for its extensive coal and iron works; *Swansea*, the next largest, is the chief place for smelting copper ores; *Pembroke* has a government dock-yard in which some of the largest ships of the navy have been built; *Milford Haven* is noted for its excellent and spacious harbour; *Wrexham* and *Welshpool* are noted for flannel manufactures; *Cardiff* is the port of Merthyr-Tydvil; *Caernarvon* is celebrated for its castle, in which the first Prince of Wales (Edward II.) was born; *Holyhead* is the usual port of embarkation for Dublin; and *Bangor* and *Beaumaris* are much resorted to for sea-bathing.

POPULATION OF THE PRINCIPAL TOWNS.—England contains a greater number of large towns than any country in the world. The following are the principal; and their population, according to the Enumeration Abstracts in 1861, was as follows:—London, 2,803,034; Manchester, including Salford, 460,018; Liverpool, 443,874; Birmingham, 295,955; Leeds, 207,153; Sheffield, 185,157; Bristol, 154,993; Wolverhampton, 147,646; Greenwich, including Deptford and Woolwich, 139,286; Newcastle-upon-Tyne, 109,291; Bradford, 106,218; Stoke upon-Trent, 101,303; Hull, 98,994; Portsmouth, including Portsea, 94,546; Brighton, 87,311; Preston, 82,961; Sunderland, including Bishop Wearmouth, 80,324; Nottingham, 74,531; Norwich, 74,414; Oldham, 72,324; Bolton, 70,396; Leicester, 68,052; Devonport, 64,798; Blackburn, 63,125; Merthyr-Tydvil (Wales), 63,080; Plymouth, 62,823; Stockport, 54,681; Bath, 52,528; Southampton, 46,970; York, 45,326; Dudley, 44,975; Derby, 43,091; Swansea (Wales), 42,581; Exeter, 41,791; Coventry, 41,647; Cheltenham, 39,590; Rochdale, 38,164; Ipswich, 37,946; Walsall, 37,762; Wigan, 37,657; Bury, 37,564; Halifax, 37,015; Chatham, 36,177; Macclesfield, 36,095; South Shields, 35,223; Huddersfield, 34,874; Great Yarmouth, 34,803; Tynemouth, 33,991; Ashton-under-Line, 33,925; Gateshead, 33,589; Northampton, 32,813; Cardiff (Wales), 32,421; Worcester, 31,122; Chester, 31,101; Carlisle, 29,436; Oxford, 27,561; Warrington, 26,852; Cambridge, 26,351; Dover, 24,970; Reading, 24,965; Colchester, 23,815; Newport (Monmouth), 23,248; Wakefield, 23,189; Hastings, 23,103; Maidstone, 23,026; Shrewsbury, 22,055; Hythe, 21,372; Canterbury, 21,323; Lincoln, 20,995.

ENGLAND AND WALES.

References to the Map of England and Wales.

Appleby, .	. 66	Carlisle, .	. 65	Durham, .	. 61
Bath, . .	. 27	Caermarthen,	. 84	Ely, . .	. 35
Beaumaris, .	. 74	Caernarvon,	. 75	Exeter, .	. 17
Bedford, .	. 40	Chatham, .	. 2	Falmouth, .	. 19
Birmingham,	. 46	Chelmsford,	. 31	Flint, . .	. 71
Brecon, .	. 82	Chester, .	. 70	Gloucester,	. 28
Bridgewater,	. 22	Chichester, .	. 9	Harlech, .	. 76
Brighton, .	. 8	Colchester, .	. 32	Halifax, .	. 55
Bristol, .	. 26	Coventry, .	. 44	Hereford, .	. 80
Cambridge,	. 34	Denbigh, .	. 73	Hertford, .	. 30
Canterbury,	. 3	Derby, .	. 50	Hull, . .	. 57
Cardiff, .	. 24	Dorchester,	. 15	Huntingdon,	. 39
Cardigan, .	83	Dover,	. 5	Ipswich, .	. 33

Kendal,	67	Monmouth,	81	St. David's,	85
Lancaster,	68	Montgomery,	78	Salisbury,	14
Launceston,	20	Newcastle,	62	Scarborough,	59
Landaff,	25	Northampton,	41	Sheffield,	53
Leeds,	56	Nottingham,	51	Shrewsbury,	77
Leicester,	43	Norwich,	37	Southampton,	11
Lewes,	7	Oakham,	42	Stafford,	48
Lichfield,	47	Oxford,	29	Taunton,	21
Lincoln,	52	Pembroke,	86	Warwick,	45
Liverpool,	69	Plymouth,	18	Wells,	23
London,	1	Portsmouth,	10	Weymouth,	16
Lynn,	38	Radnor,	79	Winchester,	12
Maidstone,	6	Reading,	13	Worcester,	49
Manchester,	54	Ripon,	60	Yarmouth,	36
Margate,	4	St. Asaph,	72	York,	58

RIVERS.

A A Thames.	C Great Ouse.	E Trent.	G Humber.
B B Severn.	D Wye.	F Ouse.	H Tees.

AGRICULTURE.—The eastern and south-eastern counties of England are distinguished for *agriculture:* as Kent, Essex, Suffolk, Norfolk, Hampshire, Berkshire, Bedfordshire, Surrey, Sussex; with parts of Lincoln, Yorkshire, Durham, and Northumberland.

MANUFACTURES.—The northern, western. and north-midland counties are distinguished for *mines* and *manufactures.* The principal mineral productions are coal, iron, copper, lead, tin, and salt; but *coal*[a] is by far the most important of the mineral treasures of Eng-

[a] "It is hardly possible to overrate the advantages Great Britain derives from her vast, and to all practicable purposes, inexhaustible supply of coals. In this climate, fuel ranks among the principal necessaries of life, and it is to our coal mines that we owe abundant and cheap supplies of so indispensable an article. But this is not the only advantage we derive from our coal mines; they are the principal source of our manufacturing and commercial prosperity. Since the invention of the steam engine, coal has become of the highest importance as a moving power; and no nation, however favourably situated in other respects, not plentifully supplied with this mineral, need hope to rival those that are, in most branches of manufacturing industry. To what is the astonishing increase of Glasgow, Manchester, Birmingham, Leeds, Sheffield, &c., and the comparatively stationary and declining state of Canterbury, Winchester, Salisbury, and other towns in the south of England, to be ascribed? It cannot be pretended, with any show of reason, that the inhabitants of the former are naturally more ingenious, enterprising, or industrious, than those of the latter. The abundance and cheapness of coal in the north, and its scarcity and consequent high price in the south, is the real cause of this striking discrepancy. The citizens of Manchester, Glasgow, &c., are able, at a comparatively small expense, to put the most powerful and most

land. In fact, the manufacturing and commercial wealth of Great Britain is principally due to the inexhaustible supply of coal.

The COTTON manufacture has its chief seat in Lancashire, Cheshire, and the neighbouring counties of the north-midland district; but especially in Lancashire, which contains more than half of the number of all the cotton-mills in England. See note [b], page 203.

The WOOLLEN manufacture has its chief seat in the West Riding of Yorkshire; and the principal seats of the manufacture of IRON and HARDWARE are the south of Staffordshire, and the adjacent parts of Warwickshire and Worcestershire.

CLIMATE, SURFACE, AND SOIL.—The *climate* of England, though variable, and somewhat humid, particularly in the western parts of the island, is, generally speaking, mild, genial, and salubrious. Its *surface*, except in the northern and western counties, is generally either level, or composed of gently rising hills and sloping valleys; and its *soil*, particularly in the midland, eastern, and southern counties, is distinguished for its fertility and high state of cultivation. In the north, in particular, there are several barren tracts, and in some of the eastern counties there are extensive fens or marshes; but, in general, England is a fertile, rich, and beautifully-wooded country.

ANTIQUITIES AND CURIOSITIES.—The *antiquities* of England may be classed under four heads, namely, the *British* or *Celtic*, the *Roman*, the *Gothic*, and the *Danish*. The most remarkable of the British antiquities is *Stonehenge*,[a] in Wiltshire, which is supposed to have been a *Druidical temple*; and in Wales, particularly in the isle of Anglesey, there are many other Druidical remains. The *Roman* antiquities consist of the remains of encampments and fortifications, military ways, altars, inscriptions, arms, coins, &c. The principal *Gothic* antiquities consist of cathedrals, minsters, (as Westminster and Yorkminster), and other architectural relics; and the *Danish* antiquities consist of the remains of raths, circular camps, &c.

The principal natural *curiosities* are the *Peak* and the *petrifactions* in Derbyshire; the *lakes* and picturesque scenery of Cumberland, &c.

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complicated machinery in motion, and to produce results quite beyond the reach of those who have not the same command of coal, or as it has been happily defined—hoarded labour. Our coal mines have been sometimes called the BLACK INDIES; and it is certain that they have conferred on us a thousand times more real advantage than we derive from the conquest of the Mogul empire, or than we should have reaped from the dominion of Mexico and Peru."—*M'Culloch.*

[a] It consists of the remains of two large concentric *circles* of huge upright stones; and of two *oval* ranges of similar formation, which lie within the circles, and have the same centre. The outer circle is 108 feet in diameter, and the interior, 90. The upright stones are from 18 to 20 feet high, from 6 to 7 broad, and about 3 feet thick. They are placed at the distance of 3½ feet from each other, and are connected at the top by immense stones laid horizontally across them. About 140 of these huge stones still remain.

SCOTLAND.

SCOTLAND, which forms the northern portion of the island of Great Britain, is bounded on the south by the Solway Frith, the Cheviot Hills, and the River Tweed, which separate it from England; on the north by the Atlantic Ocean; on the west by the North Channel and Atlantic Ocean; and on the east by the German Ocean.

Its length from Dunnet Head to the Mull of Galloway, is 288 miles; and its breadth varies from 156 to 35 miles. Its greatest breadth is from Buchan Ness in Aberdeenshire, to the most westerly point in Ross-shire; and its narrowest part is between the opposite shores of the Friths of Forth and Clyde.[a] Its AREA is estimated at 26,014 square miles, exclusive of its islands, which are supposed to contain upwards of 4,000 more; and its population, which, in 1851, amounted to 2,885,742, may now (1860) be estimated at about three millions. See page 201.

Scotland is divided into the *Highlands* and the *Lowlands*. Generally speaking, the Highlands are in the north and west of Scotland; and the Lowlands, in the south and south-east of it.[b] Generally speaking, too, the inhabitants of these two great divisions of Scotland are of different races; the former being of Celtic, and the latter of Teutonic origin.[c] Their language is also different; the mother tongue of the Highlanders being Erse or Gaelic; and that of the Lowlanders, a dialect of the English or Anglo-Saxon.

Strathmore (or the *great plain*) which extends across the country from the Frith of Forth on the east, to the Frith of Clyde on the west, is considered the general boundary between the Highlands and the Lowlands. But the term *Highlands* is more strictly confined to the counties of Sutherland, Cromarty, Ross, Inverness, and Argyle; and to the mountainous parts of Dumbartonshire, Perthshire, Forfarshire, Aberdeenshire, Banffshire, Elginshire, and Nairnshire.

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[a] Scotland lies between the parallels of 58° 40′, and 54° 38′ N.L.; and between the meridians of 1° 46′ and 6° 13′ W.L. The most easterly point is Buchan Ness; and the most westerly, Ardnamurchan Point.

[b] By looking at a map of Scotland it will be seen that the country is naturally divided into *three peninsulas* by the friths which run up into the land from the seas on the opposite sides. Hence, for geographical purposes, it would be better to divide Scotland into *Northern*, *Middle*, and *Southern* Scotland. Northern is separated from Middle Scotland by the Murray Frith, Loch Linnhe, and the valley of Glenmore, (or the *great glen*,) which extends between them in a south-west and a north-east direction. And Middle, is divided from Southern Scotland by the Friths of Forth and Clyde, and the plain of Strathmore, which extends between them.

[c] The inhabitants of the *northern* islands of Scotland, namely, the Shetlands, Orkneys, and many of the Hebrides, are of Norse or Scandinavian origin.

SCOTLAND.

References to the Map of Scotland.

Aberdeen,	23	Elgin,	31	Linlithgow,	14
Ayr,	12	Forfar,	20	Montrose,	21
Banff,	32	Glasgow,	26	Nairn,	30
Bervie,	22	Greenock,	25	Peebles,	5
Berwick,	4	Haddington,	2	Perth,	24
Carlisle,	8	Inverary,	28	St. Andrews,	18
Clackmannan,	16	Inverness,	29	Selkirk,	6
Dornoch,	34	Jedburgh,	7	Stirling,	15
Dumbarton,	27	Kinross,	17	Tain,	33
Dumfries,	9	Kirkcudbright,	10	Thurso,	35
Dunbar,	3	Kirkwall,	37	Wick,	36
Dundee,	19	Lanark,	13	Wigton,	11
Edinburgh,	1				

RIVERS.

A Tweed. | B Clyde. | C Tay. | D Dee. | E Spey.

Scotland is divided into thirty-three counties or shires, which, with their principal towns, are as follow:—

ELEVEN NORTHERN.

Counties.	*Principal Towns.*
Orkney and Shetland,	Kirkwall, Stromness, Lerwick.
Caithness,	Wick, Thurso.
Sutherland,	Dornoch.
Ross,	Dingwall, Tain, Fortrose, Stornoway.[a]
Cromarty,	Cromarty.
Inverness,[b]	Inverness, Fort George, Fort Augustus, Fort William, Portree.[a]
Nairn,	Nairn.
Elgin *or* Murray,	Elgin, Forres, Fochabers.
Banff,	Banff, Cullen, Portsoy, Keith.
Aberdeen,	New Aberdeen, Old Aberdeen, Peterhead, Fraserburgh, Huntly, Inverury.
Kincardine *or* Mearns,	Stonehaven, Bervie, Laurencekirk.

NINE MIDDLE.

Forfar *or* Angus,	Dundee, Forfar, Montrose, Arbroath, Brechin, Kirriemuir (or Killamuir).
Perth,	Perth, Dunkeld,[c] Dunblane, Callander.
Fife,	Cupar, St. Andrew's, Dunfermline, Kirkaldy, Dysart, Kinghorn.
Kinross,	Kinross.
Clackmannan,[b]	Clackmannan, Alloa.
Stirling,	Stirling, Falkirk, Bannockburn.
Dumbarton *or* Lennox,	Dumbarton, Kirkintilloch, Helensburgh.
Argyle,	Inverary, Campbelton, Oban.
Bute,	Rothsay, Lamlash (Isle of Arran).

THIRTEEN SOUTHERN.

Haddington *or* East-Lothian,	Haddington, Dunbar.
Edinburgh *or* Mid-Lothian,	Edinburgh, Leith, Musselburgh, Dalkeith
Linlithgow *or* West-Lothian,	Linlithgow, Borrowstounness, Bathgate.
Berwick *or* Merse,	Greenlaw, Dunse, Coldstream.
Roxburgh,	Jedburgh, Kelso, Hawick, Melrose.
Selkirk,	Selkirk, Galashiels.
Peebles,	Peebles, Inverleithen.
Lanark,[d]	Glasgow, Lanark, Airdrie, Hamilton.

[a] *Stornoway* is in the Isle of Lewis, and *Portree*, in the Isle of Skye.

[b] *Inverness* is the largest county in Scotland, and *Clackmannan* is the smallest. The former is nearly *ninety* times the size of the latter.

[c] *Dunkeld*, originally a *fort* or strong place of the ancient *Caledonians*. From the Celtic *dun*, a *hill*; also a *fort* on a hill. Compare *Dunbarton*, that is, the *fort* or residence of the *Britons*.

[d] *Lanark* is the most populous county in Scotland, and *Kinross* is the least populous. The former contains more than a sixth of the entire population of Scotland; and the population of the latter is under 10,000.

Counties.	*Principal Towns.*
Renfrew, ...	Renfrew, Paisley, Greenock, Port-Glasgow, Johnstone.
Ayrshire, ...	Ayr, Kilmarnock, Irvine, Girvan, Ardrossan, Troon, Saltcoats.
Dumfries, . . .	Dumfries, Annan, Moffat, Langholm.
Kirkcudbright, . .	Kirkcudbright, New Galloway.
Wigton, ...	Wigton, Stranraer, Portpatrick.

ISLANDS.—The *Shetland Islands*, the principal of which are Mainland, Yell, and Unst; the *Orkney Islands*, the chief of which are Mainland or Pomona, and Hoy. The *Hebrides*, or *Western Isles*, the principal of which are Lewis, North and South Uist (*wist*), Isle of Skye, Rum, Mull, Jura, Islay, Staffa, Iona or Icolmkill; and in the Frith of Clyde, Arran and Bute.

CAPES.—Duncansbay Head, and Dunnet Head, in Caithness; Cape Wrath, in Sutherland; Tarbetness, in Cromarty; Kinnaird's Head, and Buchan Ness, in Aberdeenshire; Fife Ness, in Fifeshire; Button Ness, in Forfar; Burrow Head, the Mull of Galloway, and Corsill Point, in Wigtonshire; the Mull of Cantyre,[a] and Ardnamurchan Point, in Argyleshire; the Butt of Lewis, in the northern extremity of the Isle of Lewis, &c.

FRITHS, LOCHS, &c.—On the *north*, the Pentland Frith; on the *north-east*, Dornoch Frith, Moray Frith, and its branches, the Friths of Cromarty and Beauley; on the *east* the Friths of Tay and Forth; on the *south*, the Solway Frith, Wigton Bay, and Luce Bay; and on the *west*, Loch Ryan, the Frith of Clyde, Lochs Fyne, Linnhe, and Broom, the Sounds of Mull, Jura, and Islay; the Minch, and the Little Minch, the Kyles[b] of Bute, &c.

MOUNTAINS.—Scotland is a very mountainous country, particularly in the north and west. The principal mountain ranges are the *Grampians*, which, generally speaking, form the natural rampart between the Highlands and the Lowlands. They commence with Ben Nevis, in the south-western extremity of Inverness-shire, and extend across the country in a north-east direction to near the eastern coast of Aberdeenshire, with branches stretching S. to the Tay, and N. and N.W. to the Moray Frith. Their highest summits are Ben Nevis,[c] Ben Macdhui[c] (Aberdeen), Cairntone (Aberdeen), Cairn-

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a *Mull*, from the Celtic *maol*, means a *bald* or *bare* head land; and *Cantyre* is from *cean* or *ken*, head, and *tir* (*terra*, L.) land. Compare *Kenmore*, the great head; *Kinross*, the head of a promontory or *peninsula*; *Kenlis*, the English title of the Marquess of *Headfort* (Baron *Kenlis*). *Kinnaird*, that is the *high* or lofty head. See note b, page 192.

b *Kyles*.—The narrow passage between the N. and N.W. of Bute and the mainland (Argyle).

c *Recent* measurements make Ben Nevis 4,368 feet high, and Ben Macdhui 4,300. Ben Nevis is, therefore, the highest mountain in Scotland. See page 70.

Gorm (Banff), Ben Lawers (Perth), Schiehallon (Perth), Ben Lomond (Stirling), and Ben Cruachan (Argyle).

The *Cheviot Hills*, between Roxburgh and Northumberland, with their continuations, which, under the names of the *Moffat*, the *Lowther* and the *Lead Hills*, stretch along the north of Dumfriesshire to the borders of Ayrshire; the *Lammermuir Hills*[a] between Haddington and Berwickshire; the *Pentland Hills* in Edinburgh or Mid-Lothian; and the *Ochil Hills* in Perth and Fifeshire.

RIVERS.—The principal rivers flowing into the *German Ocean*, are the Tweed, the Tyne (Haddington), the Forth, the Severn, the Eden, the Tay, the South and North Esks, the Dee, and the Don. Into the *Atlantic Ocean*, north of Banff and Morayshire, the Deveron, the Spey, and the Findhorn. Into the *Solway Frith*, the Esk, the Annan, the Nith, and the Dee. Into the *Frith of Clyde*, the Clyde, the Irvine, the Ayr, and the Doon. The Teviot in Roxburgh, and the Ettrick, in Selkirk, flow into the Tweed; and the Earn or Erne into the Tay. The three principal rivers of Scotland are the Clyde, the Forth, and the Tay.

LAKES.—Lochs Lomond and Katrine, in the south of the Highlands, celebrated for their beautiful and picturesque scenery. Loch Ness, Loch Oich, and Loch Lochy, in Inverness-shire, connected by the great Caledonian Canal, which runs in the direction of these lochs, from Loch Linnhe to the Moray Frith; Loch Tay, Loch Earn, and Loch Rannoch, in Perthshire; Loch Awe, in Argyle; Loch Leven, in Kinross; Loch Shin, in Sutherland, &c.

CLIMATE, SURFACE.—The climate of Scotland differs from that of England in being several degrees colder and moister. The surface of the country, particularly in the north and west, is rugged, mountainous, and, with the exception of a few fertile valleys, ill adapted for agriculture.

The middle parts of the country, particularly the valleys of the Grampians, afford good pasturage for sheep and black cattle, immense numbers of which are annually driven to be fattened in the rich pastures of England.

In the Lowlands, or south-eastern parts of Scotland, AGRICULTURE is much advanced, and the soil is in general fertile. The grains chiefly cultivated are, oats, rye, and barley. Wheat is also extensively grown in the counties of Haddington, Edinburgh, Linlithgow, and Berwick, in which agriculture has been carried to the greatest perfection.

Scotland is rich in minerals, particularly in coals, iron, lead, stone, and slate; and its MANUFACTURES and COMMERCE are extensive and flourishing. Its chief manufactures are, cotton, linen, and woollen goods, coal and iron working, ship-building, machinery of all kinds, glass and earthenware.

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[a] *Lammermuir*, that is, the *moor* that reaches (*à la mer*) to the sea.

A line drawn from Fife Ness to the Clyde opposite Dumbarton, and another from St. Abb's Head in Berwickshire, to Girvan in Ayrshire, include all the important *coal-fields* in Scotland. *Iron* is also found in several parts of this district, particularly in the neighbourhood of Glasgow. The great manufactures of Scotland are confined to this district, with the exception of Aberdeen, Dundee, and Galashiels, which are seats respectively of the cotton, linen, and woollen manufactures.

PRINCIPAL TOWNS.—*Edinburgh*, near the Frith of Forth, is the metropolis of Scotland. It is a beautiful city, and has long been distinguished as a seat of science and literature. It has few manufactures; but it carries on an important trade through *Leith*, its seaport, which is about two miles distant. *Glasgow*, on the Clyde, is the first city in Scotland for population, manufactures, commerce, and wealth. *Greenock*, next to Glasgow and Leith, is the principal seaport of Scotland. *Paisley* is noted for its extensive manufactures of cotton goods, shawls, and fancy goods. *Aberdeen*, at the mouth of the Dee, is the principal town in the north of Scotland. *Perth* is a large, handsome, and flourishing town. *Dundee*, on the Frith of Tay, is a large and commodious seaport, with an extensive and flourishing trade. *Inverness* on the Ness is the capital of the Highlands.

Scotland has five universities—Edinburgh, Glasgow, New Aberdeen, Old Aberdeen, and St. Andrews.

ANTIQUITIES AND CURIOSITIES.—The *antiquities* are the remains of *Druidic* temples and altars; the remains of the great *Roman* wall which ran from the Frith of Clyde to the Frith of Forth; vestiges of Roman roads, camps, &c.; and *Danish* camps and raths. The principal natural *curiosities* are the basaltic columns and the cave of Fingal, in the island of Staffa; the Fall of Fyers, near Loch Ness, and the Falls of the Clyde, near Lanark; and the lakes, which are numerous and beautiful.

CITIES AND PARLIAMENTARY BURGHS IN SCOTLAND WHOSE POPULATION IN 1861 WAS ABOVE 5,000.

Names.	Pop.	Names.	Pop.	Names.	Pop.
Glasgow,	394,857	Stirling,	13,846	Peterhead,	7,519
Edinburgh,	168,098	Dunfermline,	13,504	Wick,	7,475
Dundee,	90,425	Airdrie,	12,918	Musselburgh,	7,422
Aberdeen,	73,794	Inverness,	12,499	Port-Glasgow,	7,214
Paisley,	47,419	Kirkaldy,	10,851	Brechin,	7,180
Greenock,	42,100	Hamilton,	10,686	Irvine,	7,060
Leith,	33,530	Forfar,	9,258	Banff,	6,780
Perth,	25,251	Falkirk,	9,029	Stranraer,	6,274
Kilmarnock,	22,614	Rutherglen,	8,474	Cambeltown,	6,042
Ayr,	18,571	Dumbarton,	8,253	St. Andrews,	5,176
Arbroath,	17,591	Dysart,	8,067	Lanark,	5,048
Montrose,	14,563	Elgin,	7,543	Cupar (Fife),	5,029
Dumfries,	14,024				

IRELAND.

IRELAND lies in the Atlantic Ocean to the west of Great Britain, from which it is separated by St. George's Channel on the south-east; by the Irish Sea on the east; and by the North Channel on the north-east.

Its length from Fair Head in Antrim, to Mizen Head in Cork, is about 300 miles; and its breadth from Howth Head in Dublin, to Slyne Head in Galway, is about 170 miles.[a]

Its AREA is estimated at nearly 32,000[b] square miles; and its POPULATION in 1851, amounted to 6,551,970, or about six millions and a-half. (See note [b], p. 229).

Ireland is divided into four provinces—*Leinster* in the east, *Ulster* in the north, *Munster* in the south, and *Connaught* in the west. These provinces are subdivided into thirty-two COUNTIES, which, with their principal towns, are as follow:—

LEINSTER, TWELVE COUNTIES.

Counties.	*Principal Towns.*
Louth,	Drogheda, Dundalk, Ardee, Carlingford.
Meath,	Trim, Navan, Kells.
Westmeath,	Mullingar, Athlone, Moate, Kilbeggan.
Longford,	Longford, Granard, Edgeworthstown.
Dublin,	DUBLIN, Kingstown, Balbriggan.
Kildare,	Athy, Kildare, Naas, Maynooth.
King's County,	Tullamore, Birr or Parsonstown, Banagher, Edenderry, Philipstown.
Queen's County,	Maryborough, Portarlington, Mountmellick Mountrath.
Carlow,	Carlow, Tullow, Leighlin.
Wicklow,	Wicklow, Arklow, Bray, Enniskerry.
Wexford,	Wexford, New Ross, Enniscorthy.
Kilkenny,	Kilkenny, Callan, Castlecomer.

ULSTER, NINE COUNTIES.

Donegal,	Lifford, Ballyshannon,[c] Letterkenny.
Londonderry,	Londonderry, Coleraine, Newtownlimavady, Kilrea.

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[a] Ireland lies between 51° 26′ and 55° 21′ north latitude; and between 5° 26′ and 10° 29′ west longitude. Dunmore Head is its most westerly, and the eastern extremity of the coast of Down, its most easterly point.

[b] The estimate is 31,874 square miles, of which 711 are water.

[c] *Ballyshannon.*—The term *Bally* or *Bal* is from the Irish or Celtic word *baile*, a town or village; also, a townland. Hence its frequent occurrence in the names of places in Ireland; as *Ballymore*, that is, the *great* town; *Ballinrobe*, the town on the *Robe*; *Ballinahinch*, the town on the *island*; *Ballymony*, the town on the *bog*; *Ballintra*, the town on the *strand*, or Strandtown.

Counties.	*Principal Towns.*
Antrim,	Belfast, Lisburn, Ballymena, Carrickfergus,[a] Larne, Antrim.
Down,	Newry, Downpatrick, Newtownards, Bangor, Banbridge, Hillsborough, Donaghadee, Dromore, Holywood, Saintfield.
Armagh,	Armagh, Lurgan, Portadown, Charlemont.
Monaghan,	Monaghan, Clones, Carrickmacross.
Tyrone,	Dungannon, Omagh, Strabane.
Fermanagh,	Enniskillen,[b] Lowtherstown.
Cavan,	Cavan, Cootehill, Belturbet, Kingscourt.

MUNSTER, SIX COUNTIES.

Waterford,	Waterford, Dungarvan, Lismore, Tallow.
Tipperary,	Clonmel, Cashel, Nenagh, Roscrea, Thurles, Tipperary, Carrick-on-Suir.
Clare,	Ennis, Kilrush, Killaloe.[c]
Limerick,	Limerick, Rathkeale, Newcastle.
Cork,	Cork, Queenstown, Bandon, Youghal, Kinsale, Mallow, Fermoy.
Kerry,	Tralee,[d] Killarney, Dingle.

CONNAUGHT, FIVE COUNTIES.

Roscommon,	Roscommon, Boyle.
Leitrim,	Carrick-on-Shannon, Manorhamilton.
Sligo,	Sligo, Ballymote.
Mayo,	Castlebar, Ballina, Westport, Killala.
Galway,	Galway, Tuam, Loughrea, Ballinasloe.

ISLANDS.—Rathlin, north of Antrim; Tory Island and North Isles of Arran, west of Donegal; Achil Island, Clare Island, and Innisbofin, west of Mayo; South Isles of Arran, in Galway Bay; Valentia Island, west of Kerry; Cape Clear Island, south of Cork; Cove Island, in Cork Harbour.

CAPES.—Fair Head and Bengore Head, north of Antrim, Malin Head, Bloody Foreland, and Rossan Point, in Donegal; Achil Head

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[a] *Carraig* or *Craig* means a *rock;* also, a castle or town built on, or near a rock. Hence Carrickfergus, the castle of *Fergus*, (built on a rock); *Carrick*-on-Suir, *Carrick*-on-Shannon, &c.

[b] *Ennis*, from the Irish *inis* or *inch*, the root of which is the Latin *insula*, an island. Hence *Innismore*, the *great* island; *Innisbeg*, the *little* island; *Innishowen*, the island of *Owen;* Ennis*killen*, Innis*magrath*, Ennis*corthy*, &c.

[c] *Kill*, a *cell*, (cella, L.); a church, a church-yard or burying-place. Hence *Kilkenny*, that is, the church of *Kenny* or St. *Canice; Kilpatrick*, the church of *Patrick; Kilbride*, the church of St. *Bride* or Bridget; *Kilmore*, the *great* church; *Kildare*, the church of the *oak*. But as *kill* (*coille*, Gaelic) also signifies a wood, perhaps *Kildare* means the wood of *oaks* (*darech*). From the preceding root are derived *Derry* and *Derg*.

[d] *Tralee*, that is, the strand (*traigh*) of the Legh or Lee. Compare *Tramore*, the great strand, &c.

and Erris Head, in Mayo; Slyne Head, in Galway; Loop Head, in Clare; Mizen Head, in Cork; Cape Clear, in the Island of Cape Clear; Dunmore Head, in Kerry; Carnsore Point, in Wexford; Wicklow Head; and Howth Head.

BAYS, LOUGHS.—Dublin Bay, Dundalk Bay, Carlingford Bay, Dundrum Bay, Strangford Lough, Carrickfergus Bay or Belfast Lough, Lough Foyle, Lough Swilly, Donegal Bay, Sligo Bay, Killala Bay, Broad Haven, Blacksod Bay, Clew Bay, Galway Bay, Mouth of the Shannon, Tralee Bay, Dingle Bay, Kenmare River, Bantry Bay, Kinsale Harbour, Cork Harbour, Dungarvan Bay, Waterford Harbour, Wexford Harbour.

Ireland is remarkable for the number and excellence of its harbours, particularly on the southern, western, and northern sides. It contains fourteen in which the largest ships of the line might ride in safety; about the same number of sufficient depth for frigates; and from thirty to forty fitted for the ordinary purposes of commerce; besides numerous inlets suited for small coasters and fishing craft.

MOUNTAINS.—Compared with Scotland, and the north and west of England, Ireland may be said to be a level country. Its surface, however, is much diversified; and even where it is quite flat, the prospect is generally bounded by hills or mountains in the distance.

The mountains of Ireland do not cross the country in continuous chains or ranges, but occur in detached groups towards the coasts and extremities of the island. They may be divided into *six* distinct groups or systems, namely, the Wicklow, the Kerry, the Connemara, the Donegal, the Antrim, and the Mourne Mountains.

The *Wicklow* Mountains extend over an extensive tract of country which measures nearly sixty miles from N. to S., and thirty miles from E. to W. Lugnaquilla, their highest summit, is 3,039 feet above the level of the sea; and several other mountains of the group are upwards of 2,000. The Sugar-Loaf, which is so well known, and so much admired for the beauty of its form, is 1,651 feet high. These mountains contain valuable copper and lead mines, and also pyrites or sulphuret of iron. Gold, too, has been found among them, but in minute quantities. They are also associated with the picturesque and beautiful scenery of the county in which they are situated.

The *Kerry* Mountains form several parallel ranges which extend, generally speaking, in an easterly direction to the adjacent counties of Cork and Limerick. The most northerly range extends through the peninsula between Tralee and Dingle Bays. Mount Brandon, its highest summit, is 3,120 feet above the level of the sea. The second range extends between Dingle Bay and Kenmare River; and in the group of Magillicuddy's Reeks, which form a portion of it, is Carn Tual, the highest mountain in Ireland. It is 3,410 feet above the level of the sea. These mountains, and others of the same range, as Mangerton and the Turk Mountain, are in the neighbourhood of the celebrated Lakes of Killarney. A third range extends between Kenmare River and Bantry Bay. The highest summits of this range are upwards of 2,000 feet high.

The *Connemara* Mountains extend N. and S. through the counties of Galway and Mayo. South of Clew Bay, the highest mountains are Croagh Patrick, Muilrea, and the Twelve Pins of Bunabola; and north of it, are the Nephin Beg Mountains, the highest summit of which is 2,368 feet high. And to the eastward of them is a conspicuous mountain called Nephin, which is 2,639 feet high.

The *Donegal* Mountains extend over a large portion of the county. They contain several summits which exceed 2,000 feet in height. Errigal, which attains 2,462 feet, is the highest.

The *Antrim* Mountains form a kind of plateau, which extends from the hills which skirt the northern shores of Belfast Lough to Fair Head and the Giant's Causeway. About twenty of the summits of these mountains are from 1,000 to 1,700 feet high. Knocklade, about three miles from Ballycastle, and Divis, and the Cave Hill in the neighbourhood of Belfast, are respectively, 1,695, 1,568, and 1,185 feet high.

The *Mourne* Mountains occupy a projecting portion of the coast of the county of Down, between Dundrum and Carlingford Bays. They vary in height from 1,500 to 2,796 feet. Slieve Donard is the highest.

In the interior of the country there are several other ranges of less extent; as the Galtees, the Slieve Bloom, the Silver Mine, the Knockmeldown, and the Blackstairs Mountains.

PLAINS.—About one-fourth of the entire surface of Ireland consists of a *plain* which extends across the country from sea to sea. In this great central plain, particularly between Dublin and Galway Bays, the greatest elevations do not exceed 120 feet; but its southern half is diversified by hills of considerable elevation. It extends northward to the shores of Lough Neagh, in Ulster; and southward to the borders of Waterford, in Munster.

BOGS.—A large portion of the surface of Ireland consists of *bogs;* but as they are in general higher than the surrounding country, and not like the *fens* in England, it will be easy, comparatively speaking, to convert a large number of them either into arable or pasture land. But with regard to the *peat* bogs, they are of the utmost importance to Ireland, for without them, the inhabitants of the inland parts of the country would be almost destitute of fuel.

A line drawn from Howth Head to Sligo, and another from Wicklow Head to Galway, would include the principal bogs in Ireland. The Bog of Allen, which extends, with few interruptions, through Kildare and the King's County to the banks of the Shannon, is the largest bog in Ireland. It is traversed by the Grand and Royal Canals; and in it the Barrow, Boyne, and Brusna rivers have their sources. In several other parts of Ireland, particularly in Connaught, the bogs are very extensive.[a]

RIVERS.—The principal rivers are the Shannon, the Barrow, the Blackwater, the Bann, the Suir, the Nore, the Liffey, the Boyne, the

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[a] It is estimated that about one-seventh of the entire surface of the country consists of bog-land. See note, page 229.

Slaney, the Derg, the Foyle, the Lee, the Bandon, the Lagan, the Moy, and the Ovoca. Most of the Irish rivers are navigable.

The Shannon is the largest, and one of the most important rivers in the United Kingdom. It rises in Quilca Mountain, in Leitrim, at the height of 258 feet above the level of the sea; and flows first in a south-westerly, and then in a southerly direction to Limerick, a distance of about 160 miles. In this part of its course it passes through several lakes, the principal of which are Lough Allen, Lough Ree, and Lough Derg; and it also forms the boundary between the provinces of Connaught and Leinster. On arriving at Limerick it proceeds in a westerly direction to the Atlantic, which it enters in a noble estuary eleven miles broad. It is navigable from the sea to Lough Allen, that is, for almost the whole extent of its course; and vessels of 400 tons can ascend it as far as Limerick; and its navigation is connected with Dublin by means of the Grand and Royal Canals. The Shannon drains a greater extent of country than any other river in the British Islands. Its principal tributaries are the Suck, Fergus, Inny, Brusna, and Maig.

The Barrow is navigable from Waterford to Athy, where it communicates with the Grand Canal; the Suir to Clonmel; the Blackwater from Youghal to Cappoquin; the Slaney from Wexford to Enniscorthy; the Nore, a tributary of the Barrow, from New Ross to Innistiogue; the Lee to Cork; the Bandon from Kinsale to within 3 miles of Bandon; the Fergus to Ennis; the Moy from Killala to Ballina; the Boyne to Slane; the Lagan to beyond Lisburn, where it communicates by a canal with Lough Neagh; the Foyle to within a short distance of Strabane.

LAKES.—Lough Neagh, Lough Erne, Loughs Allen, Ree, and Derg, expansions of the Shannon; Lough Corrib, in Galway; Lough Mask, in the south, and Lough Conn in the west of Mayo; and the Lakes of Killarney in Kerry, celebrated for the picturesque beauty of their scenery.

Lough Neagh is the largest lake in the British Islands. It is more than three times as large as Lough Lomond, and twenty times as large as the largest of the English lakes. Besides minor streams, it receives the Upper Bann, and the Blackwater from the south; and it discharges its superfluous waters on the north by the Lower Bann. It communicates with Belfast by a canal which connects it with the Lagan; with Newry by another canal; and with Lough Erne by the Blackwater and the Ulster Canal. The waters of Lough Neagh are noted for their petrifying qualities.

CLIMATE, SOIL.—The climate of Ireland is mild, genial, and salubrious; but its great defect is excess of humidity, which arises from its insular position, and the prevalence of *westerly* winds. The excellent pasturage and beautiful verdure[a] for which Ireland is so remarkable, are owing principally to the moisture it receives from the vapours of the Atlantic. The soil is in general more fertile than that of England, but not so well cultivated.

[a] Hence the poetical name of Ireland, the *Green* or Emerald Isle.

AGRICULTURE.—Great improvements in agriculture have been made in Ireland of late years, and societies for the further improvement of it are extending over the country. Improved breeds of cattle have also been extensively introduced.

MINERALS.—In several parts of Ireland, particularly in the counties of Wicklow, Cork, and Waterford, there are valuable copper and lead mines. There are also seven coal fields in Ireland, three in Ulster, two in Munster, one in Leinster, and one in Connaught; but only three mines are as yet worked, and the quantity of coals annually raised from them is not very considerable. Iron ore is widely diffused, but from the want of an adequate supply of coal it is not extracted. Limestone, granite, and clay slate are widely and abundantly distributed; and in Galway, Donegal, and Kilkenny, there are inexhaustible supplies of beautiful marble. Gold and silver have been found in Wicklow, but in minute quantities.

COMMERCE.—Ireland possesses many natural advantages for commerce. Its harbours are numerous and commodious, and its coasts are so indented on all sides, that there is scarcely any place in the country more than fifty miles from the sea. The principal exports of Ireland are cattle, corn, beef, butter, pigs, bacon, hides; also linen, yarn, and flax; copper and lead ore, &c. The principal manufacture is linen, which is chiefly confined to the north. Dublin is distinguished for its beautiful tabinets, and Limerick for its lace.

PRINCIPAL TOWNS.—*Dublin*, the metropolis of Ireland, is, in rank, and importance, the second city in the British Isles, and one of the most beautiful cities in Europe. The elegance of its buildings, the beauty of its bay, and the picturesque scenery of the surrounding country, are greatly and justly admired. It is the see of an archbishop, the seat of a university, and the residence of the Viceroy or Lord Lieutenant of Ireland. It has an extensive trade; but a large portion of its foreign commerce is transacted through Liverpool and London. *Kingstown*, 7 miles from Dublin, is rapidly increasing in size and importance. It is noted for its Royal Harbour, which serves as a safety port, not only for Dublin, but also for the whole eastern coast of Ireland; for merchant vessels of the largest class can enter it in any state of the tide. It is the mail-packet station between Dublin and Holyhead. Kingstown is also noted for its excellent sea-bathing, and the beauty of its surrounding scenery.

Cork, which is considered the second city in Ireland, is distinguished for its unrivalled harbour, and its extensive commerce. It is the principal seat of the provision trade in the south of Ireland. . It is also the seat of one of the Queen's Colleges. *Belfast* is one of the most flourishing and rapidly increasing towns in Ireland. Less than a century ago it was a small and unimportant town, and it is now, in population, manufactures, and commerce, the second in the kingdom. It is the centre of the linen manufacture of Ulster, and also of the sewed muslin trade, which gives employment to thousands of females in all parts of

the province. It is also most extensively engaged in the flax and cotton spinning trade. *Galway*, on a fine bay called by its name, is the largest and most important town in Connaught. It is the seat of one of the Queen's Colleges; and recently a line of packets between it and New York has been established, to which liberal aid has been contributed by the Government. *Limerick*, on the Shannon, is the fourth city in Ireland; *Waterford*, on the Suir, is next in importance. Londonderry, Drogheda, Newry, Wexford, Sligo, and Dundalk are also important seaports; and Kilkenny, Clonmel, Armagh, Ballymena, and Lisburn are the largest inland towns.

EDUCATION.—Trinity College, Dublin; Queen's Colleges, Belfast, Cork, and Galway, which have been formed into a University; St. Patrick's College, Maynooth; and "the Catholic University," Dublin. There are also several Diocesan and Royal Schools, and numerous National, and other Schools for the education of the middle and lower classes.

ANTIQUITIES AND CURIOSITIES.—The principal *antiquities* are the *round towers*, Druidic altars, and the remains of Danish raths or circular intrenchments. The principal natural *curiosities* are the Giant's Causeway in the northern extremity of the County of Antrim, the scenery of Wicklow, and the Lakes of Killarney.

POPULATION OF THE BOROUGH TOWNS IN IRELAND.

Name.	Population in 1861.	Name.	Population in 1861.
Armagh, ...	8,933	Ennis, ...	7,127
Athlone, ...	6,170	Enniskillen, . . .	5,701
Bandon, ...	6,332	Galway,*	24,990
Belfast,*a . . .	119,242	Kilkenny, ...	17,441
Carlow, ...	8,967	Kinsale, ...	4,624
Carrickfergus (Co. and Town of), . . .	9,398	Limerick,*	55,234
Cashel, ...	5,596	Lisburn, ...	9,653
Clonmel, ...	11,190	Londonderry, . . .	20,493
Coleraine, ...	6,208	Mallow, ...	4,824
Cork,*	101,534	New Ross, ...	7,115
Downpatrick, . . .	4,310	Newry, ...	12,334
Drogheda, ...	18,094	Portarlington, . . .	2,679
Dublin,*	258,328	Sligo, ...	13,361
Dundalk, ...	10,404	Tralee, ...	10,921
Dungannon, ...	3,886	Waterford,*	29,160
Dungarvan, ...	8,614	Wexford, ...	12,015
		Youghal, ...	6,749

a The towns marked with an *asterisk* return two members each; and Dublin, four, but two are for the University. All the other towns return one representative each.

EXTENT AND POPULATION OF THE PROVINCES AND COUNTIES OF IRELAND.

Provinces.	Statute Acres.[a]	Population in 1861.	Provinces.	Statute Acres.[a]	Population in 1861.
LEINSTER:			ULSTER:		
Carlow, .	221,342	57,232	Antrim, .	761,877	376,054
Dublin, .	226,414	402,022	Armagh, .	328,076	189,382
Kildare, .	418,436	84,930	Cavan, . .	477,360	153,972
Kilkenny, .	509,732	123,557	Donegal, .	1,193,443	236,859
King's Co., .	493,985	88,491	Down, . .	612,495	299,866
Longford, .	269,409	71,592	Fermanagh, .	457,195	105,372
Louth, . .	201,906	89,870	Londonderry,	518,595	184,137
Meath, . .	579,899	110,609	Monaghan, .	319,757	126,340
Queen's Co. .	424,854	90,750	Tyrone, .	806,640	238,426
Westmeath, .	453,468	90,856			
Wexford, .	576,588	143,594	Total, . .	5,475,438	1,910,408
Wicklow, .	500,178	86,093			
			CONNAUGHT:		
Total, .	4,876,211	1,424,866	Galway, .	1,566,354	271,042
			Leitrim, .	392,363	104,615
MUNSTER:			Mayo, . .	1,363,882	254,449
Clare, . .	827,994	166,275	Roscommon, .	607,691	156,154
Cork, . .	1,846,333	537,496	Sligo, . .	461,753	125,079
Kerry, . .	1,186,126	201,988			
Limerick, .	680,842	215,609	Total, .	4,392,043	911,339
Tipperary, .	1,061,731	247,496			
Waterford, .	461,553	134,336			
Total, :	6,064,579	1,503,200	Total of Ireland,	20,808,271	5,764,543

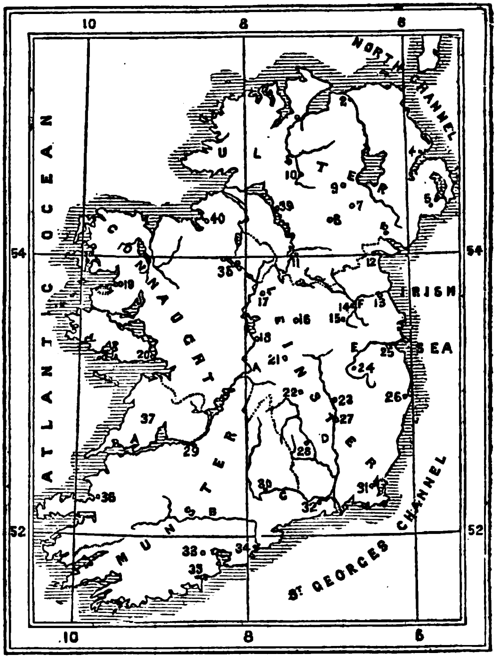
POPULATION OF IRELAND AT DIFFERENT PERIODS.[b]

Years.	Population.	Years.	Population.	Years.	Population.
1726	2,309,106	1785	2,845,932	1831	7,767,401
1754	2,372,634	1805	5,395,466	1841	8,175,124
1767	2,544,276	1813	5,937,856	1851	6,551,970
1777	2,690,556	1821	6,801,127	1861	5,764,543

[a] In each county there is a large extent of surface unfit for cultivation. The proportion, of course, varies in each province and county. The number of *arable* acres in each province is as follows:—Leinster, 3,961,188; Munster, 3,874,613; Ulster, 3,407,539; Connaught, 2,220,960. Hence, it appears that Leinster is the most, and Connaught the least extensively cultivated, in proportion to their extent. If 100 be taken to represent the whole surface of Ireland, it may be divided as follows:—Arable land, 64·7; plantations, 1·7; uncultivated, 30·3; towns, ·2; water, 3.

[b] According to the last census (1861), the population of Ireland is but 5,764,543, that is, a *decrease*, within 10 years, of about 12 per cent. (12·02). In the province of Connaught, the decrease is 9·77 per cent.; in Munster, 19·08; in Ulster, 5·04; and in Leinster, 13·94.

IRELAND.



References to the Map of Ireland.

Armagh, .	7	Cork, . .	33	Kinsale, .	35	Omagh, .	10
Athlone, .	18	Downpatrick,	5	Limerick, .	29	Sligo, . .	40
Belfast, .	3	Dublin, .	25	Londonderry,	1	Tralee, .	36
Carlow, .	27	Dungannon,	9	Longford, .	17	Trim, . .	15
Carrickfergus,	4	Dundalk, .	12	Maryborough,	22	Tullamore, .	21
Cavan, .	11	Drogheda, .	13	Monaghan,	8	Waterford, .	32
Carrick-on Shannon,	38	Ennis, .	37	Mullingar,	16	Westport, .	19
		Enniskillen,	39	Naas, .	24	Wexford, .	31
Clonmel, .	30	Galway, .	20	Navan, .	14	Wicklow, .	26
Coleraine, .	2	Kilkenny, .	28	Newry, .	6	Youghal, .	34

RIVERS.

A Shannon. | B Blackwater. | C Suir. | D Barrow. | E Liffey. | F Boyne.

HISTORICAL SKETCH OF

GREAT BRITAIN AND IRELAND.

ENGLAND was originally peopled by the ancient CELTS, who, migrating from Asia in the earliest ages of the world, gradually spread over the *south* and *west* of Europe, and the adjoining islands.

At subsequent periods the eastern and south-eastern coast was occupied by the *Belgæ* and other GOTHIC tribes, who also originally migrated from Asia, the cradle of the human race, and spread over the *north* and *north-west* of Europe.

The *Phœnicians* traded with the inhabitants of Cornwall for tin[a] several centuries before the Christian era; but little was known of the country till the invasion of it by the ROMANS, under Julius Cæsar. This event occurred in the fifty-fifth year before the Christian era.

At this period its inhabitants had made little progress in civilization. They had nothing deserving the name of city or town; their dwellings were mere hovels; and their clothing was the skins of animals. The parts of their bodies which were exposed they *painted* or stained with the juice of herbs, from which custom it is said they were called *Britons*, and the country *Britannia*, that is the *painted nation*.[b] They were, however, a brave and warlike people; and it was not without difficulty that the victorious legions of Cæsar reduced them to submission. After the time of Cæsar, Britain remained unmolested by the Romans for nearly a hundred years. In the year 43, after the Christian era, an expedition was despatched by the Emperor Claudius to complete the conquest of the country, which was finally effected in about 20 years after by the celebrated Roman general, Agricola.

The Romans continued to keep possession of the country till about the year 430, at which period they were obliged to withdraw all their troops from the out provinces for the defence of Italy against the *barbarous nations of the north.*

Under the Romans the arts of peace were introduced into Britain, and the natives rapidly advanced in civilization; but they entirely lost the martial spirit and love of freedom for which their ancestors were so distinguished. Hence, on the departure of the Romans, the Britons became an easy prey to their rude and rapacious neighbours, the PICTS and the SCOTS. Having in vain besought the Romans to return, they solicited the SAXONS, a warlike people of northern Germany, to fight their battles against the Picts and the Scots, offering

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[a] Hence, the term *Cassiterides* or *Tin* islands, which was afterwards restricted to the Scilly Isles.

[b] The PICTS, according to some authors, derived their name from the same custom, which is indeed common to most barbarous nations.

them as a reward for their services the Isle of Thanet, which forms a part of the county of Kent.[a]

The SAXONS, under Hengist and Horsa, arrived in Britain in the year 449; and having repelled without difficulty the Picts and Scots, they turned their arms against the Britons themselves, whom they dispossessed of the south-eastern part of the island. The success which attended the arms of the Saxons, and the favourable accounts of the beauty and fertility of the country, attracted numerous bands of their countrymen; and with them a kindred tribe called ANGLES or ANGLO-SAXONS, who it is supposed occupied that part of Germany between the Elbe and the Eyder. It was from this tribe that the country was afterwards called ENGLAND, that is, *Angle land* or land of the Angles. The Saxons, Jutes, and Angles, having destroyed, enslaved, or expelled the inhabitants, particularly of the south-eastern and eastern parts of the country, established *seven* independent *kingdoms*, since known by the name of the SAXON HEPTARCHY.

The Britons that escaped from the slaughter or subjugation of the Saxons, took refuge either in Cornwall or Wales, or passed over into Armorica, in France, where they settled in great numbers among a kindred people, and gave their name to the province of *Bretagne* or *Brittany*. The Britons that settled in Wales maintained their independence till the time of Edward I.; and their descendants are to this day called the *Ancient Britons*.

Under the Saxons the customs and manners of the country were changed, as well as its name; and the language, which had been either Celtic or Latin, gave way to the Anglo-Saxon, from which the modern English is principally derived.

In the year 827 the several kingdoms of the Heptarchy were united into one, under the name of ENGLAND, by Egbert king of Wessex or the *West Saxons*. Egbert was therefore the first king of England.

About the year 866 the DANES invaded England, and took possession of the country north of the Humber; and in 1017 they were in possession of the whole kingdom, under Canute the Great, king of Denmark and Norway. But during the reign of Alfred the Great, from 871 to 901, the Danes were kept in check, and for a time expelled from the country.

On the death of Hardicanute, the son of Canute, in 1042, the Saxon monarchy was restored in the person of Edward the Confessor. Upon this monarch's death, in 1066, Harold, brother of the queen, usurped the crown; but in the same year he was defeated and slain at the battle of Hastings, by William Duke of Normandy,

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a The Isle of Thanet is separated from Kent by a narrow channel, formed by the river Stour. In it are the towns of Margate, Ramsgate, and several villages.

who claimed the kingdom under the will of Edward the Confessor. This event is known by the name of the NORMAN CONQUEST; and the Duke of Normandy, who was crowned immediately after as king of England, is called William the Conqueror. Under the Normans great changes were made in the customs, laws, and language of England.

The most important events in English history that have since taken place, are:—1. The annexation of Ireland to England in the reign of Henry II. in 1172. 2. The granting of the Magna Charta by John in the year 1215. 3. The invasions of France by Edward III. and Henry V. 4. The wars between the houses of York and Lancaster in the fifteenth century. 5. The union of the crowns of England and Scotland under James I. in 1604. 6. The great civil war in the reign of Charles I.; and the establishment of the commonwealth under Cromwell in 1649. 7. The Restoration under Charles II. in 1660. 8. The Revolution and abdication of James II. in 1688. 9. The legislative union between England and Scotland in 1707. 10. The accession of the house of Hanover in 1714. 11. The American War, 1776–1784. 12. The war with revolutionary France, 1793-1815. 13. The legislative union between Great Britain and Ireland, 1800.

SCOTLAND.

Scotland, like England, was originally peopled by the ancient *Celts.* As in England, too, the primitive inhabitants were in process of time driven to the *western* or *mountainous* part of the country by Saxon and other *Gothic* tribes, who possessed themselves of the *Lowlands* or south-eastern part of the island. Hence the difference which still exists between the inhabitants of the Highlands and those of the Lowlands of Scotland. Hence, too, the *Highland* Scotch are called *Gaels*,[a] just as those parts of England to which the ancient British retired were called *Wales* and Corn*wall.*

The ancient name of Scotland was *Caledonia.* By the Romans, who invaded it under Agricola in the year 79, it was called *Britannia Barbara;* in the eighth century it was called the country of the Picts;[b] and in the eleventh century it received its present name—SCOTLAND, which had been previously applied to Ireland.

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[a] The terms *Gael, Gaul, Wales,* and *wall,* as in Corn*wall,* are evidently different forms of the ancient Celtic word, *gal,* the meaning of which seems to be *west* or *westward.* Thus, *Gaul* (the ancient name of France) is in the west of Europe; Wales (*Galles* in French) is in the west of England; and *Gael* in the *west* of Scotland. Hence, also, *Galway* (and *Gall*oway), the *western* direction (as Norway is the *northern*); Done*gal,* &c.

[b] The similarity which still exists between the *Welsh* and *Gaelic* languages proves that they were originally the same; and it is well known that the Gaelic differs very little from the *Irish,* from which circumstance it is frequently called *Erse,* that is, *Irish.*

The Picts and Scots[a] were united into one nation about the year 843, by Kenneth Mac Alpin. His successors were chiefly employed in wars against the English and Danes. Duncan expelled the Danes from his dominions; but, in 1038, he was murdered by Macbeth, who was himself slain two years after by Macduff.

The most important events in the history of Scotland are the wars with the first three Edwards of England, in which BRUCE and WALLACE were so distinguished for their patriotism and heroic deeds. The life and times of the beautiful but unfortunate Queen of Scots, Mary Stuart, is an interesting period in Scottish history; and the accession of her son James to the throne of England, was an event of the greatest importance to both nations. This occurred in 1603; and since that period the two kingdoms have been under one sovereign. In 1707 the Legislative Union between Great Britain and Scotland was effected; and the two countries have since been called GREAT BRITAIN.

IRELAND.

Ireland, like the sister kingdoms, England and Scotland, was originally peopled by the ancient CELTS; and like them, too, its coasts, though in a less degree, were at subsequent periods taken possession of by GOTHIC tribes. Its ancient name was Ierne,[b] which means, according to some authorities, the *sacred* isle; according to others, the *western*. It was called *Juverna Hibernia*, and *Britannia Minor*, by the Romans; and subsequently, *Scotia* or Scotland. In the eleventh century this term was transferred to Scotland, and Ireland resumed its ancient name.

Ireland was probably visited by the PHOENICIANS in their voyages to England for tin; but little is *historically* known of it for several centuries after the Christian era.

In the fifth century, Christianity was introduced into Ireland by St. Patrick, and it soon after became distinguished as the seat of learning, and so continued for several centuries.

The country suffered much from the invasion of the Danes; and in 845 they were in possession of almost the whole kingdom. They were, however, soon after defeated and expelled.

In the reign of Henry II. in 1172, Ireland was annexed to the English crown.

In the reign of James I. several colonies from England and Scotland were introduced into Ireland; and great improvements were made in the laws and in the administration of justice.

In 1641 Ireland, as well as England, was involved in a civil war which was terminated by Cromwell.

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[a] The *Picts* and *Scots* were of Scandinavian origin.

[b] *Ierne*.—Hence its modern names ERIN and (*Ierneland*) IRELAND. From *Ierne* the names *Juverna* and *Hibernia* also may be easily deduced.

In 1800 the Legislative Union between Ireland and Great Britain was effected; and the three kingdoms so connected are called "The United Kingdom of Great Britain and Ireland."

In 1829, the Emancipation Bill was passed by the Legislature, which relieved the Roman Catholics of the United Kingdom from the disabilities under which they had previously laboured on account of their religion.

In 1831, the National System of Education was established by the Government on principles which must insure its success.[a]

In 1847 a great famine, caused by the almost entire failure of the potato crop. Since that distressing period Ireland has improved in every respect. To this desirable result many causes have contributed—such as emigration to the Colonies, the operation of the Incumbered Estates' Court,[b] the extension of education, and the diminution of crimes and outrages.

In 1849, Queen Victoria visited Ireland, to the great delight of all classes of Her Majesty's Irish subjects.

SOVEREIGNS OF ENGLAND SINCE THE NORMAN CONQUEST, WITH THE TIMES AT WHICH THEY BEGAN TO REIGN.

William I.	1066	11th century.	Henry VIII.	1509	16th century.
William II.	1087		Edward VI.	1547	
Henry I.	1100		Mary I.	1553	
Stephen	1135	12th century.	Elizabeth	1558	
Henry II.	1154				
Richard I.	1189		James I.	1603	17th century.
John	1199		Charles I.	1625	
Henry III.	1216	13th century.	Charles II.	1649	
Edward I.	1272		James II.	1685	
Edward II.	1307	14th century.	William III. / Mary II.	1688	
Edward III.	1326				
Richard II.	1377		Anne	1702	18th century.
Henry IV.	1399		George I.	1714	
Henry V.	1413	15th century.	George II.	1727	
Henry VI.	1422		George III.	1760	
Edward IV.	1461				
Edward V.	1483		George IV.	1820	19th century.
Richard III.	1483		William IV.	1830	
Henry VII.	1485		VICTORIA	1837	

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a The number of National Schools now (1860) in operation is 5,496, and the number of pupils attending them is upwards of 520,000.

b In 1858, an Act was passed which extended the powers of the Incumbered Estates' Court to estates not incumbered; and it is now called the *Landed Estates' Court.*

FRANCE.

BOUNDARIES.—France is bounded on the north by Belgium and the English Channel; on the west by the Bay of Biscay; on the south by the Pyrenees and the Mediterranean; and on the east by Italy, Switzerland, and Germany.

France lies between 42° 20', and 51° N. latitude; and between 4° 40' W., and 8° 15' E. longitude. Its length, from Dunkirk to the Pyrenees, is 600 miles; and its breadth, from the western extremity of Bretagne to Strasbourg, is 580 miles. Its AREA (including Corsica, Savoy, and Nice) is about 208,000 square miles; and its present POPULATION is about 36,650,000.

DIVISIONS.—France was formerly divided into 35 PROVINCES, but at the Revolution in 1789, it was subdivided into 86 DEPARTMENTS, most of which take their names from rivers and mountains within their boundaries.

PROVINCES.—French Flanders, Artois, Picardy, Normandy, Isle of France, Champagne, Lorraine, Alsace, Bretagne, Maine, Anjou, Touraine, Orleanais, Berri, Nivernois, Bourbonnais, Burgundy, Franche-Comté, Poitou, Aunis, Saintonge, Angoumois, Lamarche, Limousin, Auvergne, Lyonnais, Guienne, Gascony, Bearn, Foix, Rousillon, Languedoc, Dauphiné, Avignon, Provence.

NAMES AND CLASSIFICATION OF THE DEPARTMENTS.—*Eight Northern.*—Nord, Pas de Calais, Somme, Aisne, Ardennes, Meuse, Marne, Oise.

Eleven North-Western.—Seine Inférieure, Eure, Calvados, Manche, Orne, Mayenne, Ille et Vilaine, Côtes du Nord, Finisterre, Morbihan, Loire Inférieure.

Six South-Western.—Vendee, Charente, Charente Inférieure, Gironde, Landes. Basses Pyrénées.

Ten Eastern.—Moselle, Meurthe, Haute Marne, Vosges, Bas Rhin, Haute Saône, Doubs, Jura, Ain.

Seven South-Eastern.—Isere, Drôme, Hautes Alpes, Basses Alpes, Var, Vaucluse, Bouches du Rhone.

Fifteen Southern.—Ardèche, Gard, Herault, Aude, Pyrénées Orientales, Ariège, Hautes Pyrénées, Gers, Lot et Garonne, Lot, Tarn et Garonne, Haute Garonne, Tarn, Aveyron, Lozere.

Twenty-eight Central.—Seine, Seine et Oise, Seine et Marne, Aube Yonne, Côte d'Or, Nièvre, Loiret, Eure et Loire, Sarthe, Loire et Cher, Indre et Loire, Maine et Loire, Deux Sèvres, Vienne, Indre, Cher, Allier, Saône et Loire, Rhone, Loire, Haute Loire, Creuse, Haute Vienne, Dordogne, Corrèze, Canthal.

To these are to be added Corsica, Savoy, and Nice—the latter under the name of the *Maritime Alps.*

CHIEF TOWNS.—Paris, the metropolis, on the Seine; Lyons, at the junction of the Rhone and the Saône; Marseilles, on the Gulf of Lyons; Bordeaux, on the Garonne; Rouen, on the Seine; Nantes, on the Loire; Toulouse, on the Garonne; Lisle or Lille, in French Flanders; Strasbourg, on the Rhine; Orleans, on the Loire; Toulon, on the Mediterranean; Havre-de-Grace, at the mouth of the Seine;

Brest and Cherbourg, on the English Channel: with several other large and important towns. Also, Bastia and Ajaccio, in Corsica, the latter of which is distinguished as the birth-place of Napoleon; to which are to be added, Chambery and Nice, the chief towns of the lately annexed provinces.

PARIS is the second city in Europe in size, and, perhaps, the first in splendour. For palaces, public buildings, promenades, and places of amusement, it is unrivalled. It is also distinguished for the number and high character of its literary and scientific institutions. *Lyons*, the second city in France, has long been distinguished as the first silk manufacturing city of Europe. It still furnishes more than half of all the silk goods produced in France. *Marseilles*, which was considered an ancient city in the time of Julius Cæsar,[a] is one of the most flourishing and most important cities in France. It is the great outlet for the produce and manufactures of the southern provinces; and the channel of communication between France and the northern coasts of Africa, and the Levant. It is also the best and most frequented port in the Mediterranean. *Bordeaux* is the next city in commercial importance; and next, *Havre-de-Grace*, which may be regarded as the seaport of Paris. *Strasbourg* is celebrated for its cathedral, the spire of which is 466 feet high[b]; *Orleans*,[c] for its great antiquity, and the exploits of Joan of Arc; *Nîmes*, for its Roman antiquities; and *Tours*, as the place where Charles Martel defeated and drove the Saracens from France (in 732). *Amiens* is noted for an important treaty between England and France in 1802; and also for its splendid Gothic cathedral; and *Montpelier* is much resorted to by invalids for the salubrity of its climate.

POPULATION OF THE PRINCIPAL TOWNS.—The population of the principal towns in France in 1857 was as follows:—Paris, 1,178,862[d]; Lyons, 292,721: Marseilles, 250,000; Bordeaux, 149,928; Nantes, 108,530; Rouen, 103,223; Toulouse, 103,144; St. Etienne, 94,432; Toulon, 82,705; Lille, 78,641; Strasbourg, 77,656; Metz, 64,727; Havre, 64,137; Brest, 61,160; Amiens, 56,587; Nîmes, 53,619; Orleans, 47,393; Montpellier, 45,811; Rheims (or Reims), 45,754; Caen, 45,280; Besançon, 41,295; Rennes, 39,505; Avignon, 35,890; Versailles, 35,367; Tours, 33,530; Boulogne, 30,783; Dunkerque, 29,080; Cherbourg, 28,012.

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[a] *Marseilles* was founded by the Phocians 539 years B.C.

[b] That is about 33 feet higher than St. Peter's in Rome, and only 14 feet lower than the great pyramid of Cheops. The clock of this cathedral is celebrated for the extraordinary ingenuity of its mechanism. It shows the motions of the earth and planets, and the increase and decrease of the moon. The days of the month are pointed out by a statue; the hours of the day are announced by a golden cock, and struck on the bell by a figure representing an angel, while another turns an hour-glass as soon as the clock has finished striking. The quarters are also struck, the first by a child with an apple, the second by a youth with an arrow, the third by a man with a tip-staff, and the fourth by an old man with a cane.

[c] *Orleans* is named after the Emperor *Aurelian*, who rebuilt it.

[d] *Paris*. In 1858, the population of Paris, including the suburbs, was 1,727,419.

MOUNTAINS.—The Pyrenees, Alps, Puy-de-dôme, Mont Jura, Côte d'Or, the Cevennes, and the Vosges. See page 86.

RIVERS.—The principal rivers are the Seine, the Loire, the Garonne, the Rhone, the Rhine, and the Meuse. See page 97.

These six rivers may be regarded as the principal basins, into some one of which almost all the other rivers of France empty.

LAKES.—The lakes are few and small; but extensive lagoons occur both on its south and south-western coasts.

CANALS.—Languedoc,[a] Burgundy, and Orleans.

ISLANDS.—The principal islands are Corsica, Ushant, Belleisle, Isles of Rhe, Oleron, and Hieres.

CAPES.—La Hogue, Barfleur, Gris-Nez, Bec du Raz.

COLONIES.—The principal and most important colony of France is Algeria in the north of Africa.

The other colonies and foreign possessions are—In *Africa*, Senegal, and small portions of Madagascar; the islands of St. Louis and Goree on the west coast; and Reunion or Bourbon, and St. Marie, in the Indian Ocean. In *Asia*, Pondicherry, Chandernagore, Karical, Yanaon, and Mahé; and in the Pacific Ocean, the Marquesas, Tahiti or Otaheite, and New Caledonia. In *America*, French Guiana and Cayenne; and in the *West Indies*, Martinique, Guadalonpe, Marie Galante, the northern part of St. Martin, and the small isles of Desirade and Saintes. Also the small islands of St. Pierre and Miquelon, south of Newfoundland.

CLIMATE, SOIL, SURFACE.—France enjoys one of the finest *climates* in Europe; its *soil* is generally fertile; and its *surface* is, for the most part, level, or slightly undulating. It abounds in vineyards;[b] and in the south, it produces olives, figs, oranges, and the mulberry tree, which is so important to their *silk* manufactures.

PRODUCTIONS.—The principal productions are brandy, wines,[c] grain, oil, fruit, madder, tobacco, hemp, flax, and beet-root, which is extensively used for making sugar.

AGRICULTURE.—France is essentially an agricultural country; and about three-fifths of the entire population are engaged in pursuits connected with it.

MANUFACTURES.—Its principal manufactures are silks, woollens, cottons, linens, laces, porcelain, jewellery, watches and clocks, coloured glass, artificial flowers, articles of fashion, ribbons, lace, gloves, perfumery, fire-arms, and cutlery.

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[a] The canal of Languedoc, which connects the Mediterranean with the Atlantic, is 150 miles long, 60 feet broad, and 6 feet deep. It is one of the great works of the reign of Louis XIV.

[b] Its vineyards cover about 5 millions of acres; and the woods and forests, which supply most of the fuel used in France, occupy about 17½ millions.

[c] The wines of France, particularly those of Burgundy, Champagne, and the claret of Bordeaux, are the most esteemed of any in Europe.

The most important and characteristic manufacture of France is that of *silk fabrics*, which surpass those of any other country in richness of material, brilliancy of colour, and elegance of design. The silk manufactures are chiefly in the south and south-east; and the woollen, cotton, and lace, in the north and north-east. Lyons, Nîmes, Avignon, Tours, St. Etienne, and Paris are the chief seats of the silk manufacture—particularly *Lyons*. Sedan, Louviers, Rouen, Elbeuf, Abbeville, and Amiens are the chief seats of the woollen manufacture. Rouen is also noted for its extensive cotton and linen manufactures. Also Lille, Cambray, Valenciennes, &c. The two latter, with Dieppe and Alençon, are also noted for the manufacture of lace.

COMMERCE.—The commerce of France is very extensive, but greatly inferior to that of the British Empire. The principal ports are Marseilles, Havre, Bordeaux, Nantes, La Rochelle, Dunkerque, Boulogne, Dieppe, St. Malo, Bayonne, and Cette.

NAVAL PORTS.—Cherbourg (recently fortified in the strongest possible manner), Brest, L'Orient, Rochefort, and Toulon.[a]

RELIGION.—The established religion is Roman Catholic, but all others have full toleration; and Protestant clergymen are paid by the state.

GOVERNMENT.—The government is in form constitutional, but it is absolute in reality. See page 200.

In LITERATURE and SCIENCE France has long held a distinguished rank; but till the reign of Louis Philippe the education of the great body of the people was almost entirely neglected. Since that period, an organized and extensive system of popular education has been in operation under the control of the government.

The French are a brave, lively, intelligent, and ingenious people; and are noted for their politeness and attention to strangers.

HISTORICAL SKETCH.

France was originally peopled by the ancient *Celts*, whom the Romans called *Gauls*. It was conquered by Julius Cæsar about 60 years B.C.; and it continued to form a part of the Roman empire till it was subdued by the *Franks*, under Clovis, who gave it its present name. Clovis was the first king of France, and under him Christianity became the religion of the state. In the year 800, the celebrated *Charlemagne*

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[a] If the naval power of France were equal to its military, it would be the most powerful country in the world. Its standing army, in the zenith of Napoleon's power, amounted to 1,200,000 men; and its fleet to 73 ships of the line, 67 frigates, and a large number of smaller vessels. The naval power of France was, however, almost annihilated by Britain. From the commencement of the Revolutionary war to the Peace of Paris in 1814, we took or destroyed 97 of their line-of-battle ships, 219 frigates, and large numbers of smaller vessels.

The French army, in 1842, amounted to 344,000 men, and the navy to 46 ships of the line, 47 frigates, and several smaller vessels. Both forces, particularly the navy, have been greatly increased since.

or Charles the Great, was crowned Emperor of the West. His conquests extended over Spain, Germany, and the greater part of Italy. But soon after his death, the German empire was separated from France. In 912, the Normans or Northmen (from *Norway*), subdued, and settled in a part of France (Neustria), to which they gave its present name, *Normandy*. It was the descendants of the same people who, in 1066, achieved the conquest of England, under William Duke of Normandy.

In 987, Hugh Capet supplanted the reigning family, and became the founder of the third race of French kings. Among the succeeding events in French history may be mentioned the wars with Edward III. and Henry V. of England, which proved most disastrous to France. In the former wars, John, the French monarch, was made prisoner; and the result of the latter was, that Henry was declared heir to the crown of France (in 1420), and on his death, his son, Henry VI., was proclaimed king of it. In a few years after, the French, headed by the celebrated *Joan of Arc*, gained several battles over the English; who, though they were again victorious, were obliged soon after to retire from the country (in 1450). In 1597, Henry IV., King of Navarre, the first of the house of Bourbon, ascended the throne of France. This great and good prince was assassinated in 1610. Louis XIV. began to reign in 1643, at the age of five years. During his long and prosperous reign, France made great advances in science and literature, and attained a high rank among the nations of Europe. In 1789 the ancient government was overturned by one of the most sanguinary revolutions on record. The king, Louis XVI., was beheaded in 1793, and a republic established, which was in its turn subverted, and General Bonaparte, a Corsican, became the supreme ruler of the nation, under the title of First Consul, in 1799, and in five years after (1804), he became Emperor. The events since that period are well known.

ARMY.—France is the greatest military power in the world. Its army at present amounts to about 500,000 men, with a large body of reserves.[a]

NAVY.—The naval force of France has been greatly augmented of late years. It now equals more than two-thirds of that of the British empire.[a]

REVENUE, &c.—The revenue amounts to nearly £70,000,000; and the NATIONAL DEBT to about £350,000,000.

IMPORTS AND EXPORTS.—The annual value of the *imports* is about £80,000,000; and that of the *exports*, about £75,000,000.

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[a] The nominal army for 1859 consisted of 510,640 infantry; 100,221 cavalry; 68,544 artillery; 15,448 engineers, and 12,600 equipage train, that is, it amounted in all to upwards of 700,000 men. This is stated in the *Almanach de Gotha* for 1860, which derives its information from official sources. And, according to the same authority, the French fleet consists of 461 vessels, carrying 12,520 guns, and 60,000 seamen, with a large body of marines. Of these, 252 are sailing vessels, and 209 steamers. Of the sailing vessels, 30 are line-of-battle-ships, and 32 are frigates; and of the steamers, 30 are line-of-battle-ships, and 10 are frigates.

RUSSIA.

BOUNDARIES.—Russia is bounded on the north by the Arctic Ocean; on the west by Norwegian and Swedish Lapland, Prussia, Austria, and Turkey; on the south by Turkey, the Black Sea, the Sea of Azov, and the Caucasian Mountains; and on the east by the Caspian Sea, the Ural River, and the Ural Mountains.

Russia extends from 38° 21′ to 70 N. L., and from about 18° to 68° E. L. Its length from the southern extremity of the Crimea to the Arctic Ocean, is 1,700 miles; and its breadth from the Ural Mountains to the Baltic is 1,500 miles. Its AREA is estimated at 2,130,000 square miles; and its POPULATION at 64 millions.[a]

Russia occupies more than the half of the whole continent of Europe. It comprises the greater part of the ancient kingdom of Poland, Finland, East Bothnia, part of Lapland, the Crimea or Taurida, Bessarabia, and part of Moldavia.

DIVISIONS.—Russia may be divided into six great divisions, namely, the Baltic Provinces, Great Russia, Little Russia, West Russia, South Russia, and East Russia; and these great divisions are subdivided into 52 provinces or governments.

The *Baltic Provinces* are the most important. They comprise the GOVERNMENTS of St. Petersburg, Esthonia, Livonia, Kourland, and Finland; and they contain the following important towns—St. Petersburg, Cronstadt, Riga, Revel, and Helsingfors.

Great Russia comprises the central and original provinces of the empire. It contains 19 governments; and the principal towns are Moscow,[b] Nijnii Novogorod, Smolensk, and Archangel.

Little Russia comprises 4 governments; and their chief towns are Kiev and Poltava.

West Russia consists of provinces that formerly belonged to the kingdom of Poland. It comprises 9 governments; and the chief towns are Warsaw and Vilna, or Wilna.

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[a] This is its estimated extent in *Europe*, but in addition to this, it comprises the whole of Northern Asia, and a large portion of the north-west part of North America (from Behring's Straits to the meridian of 140° W. L.). In fact, this huge empire extends over more than a seventh of the whole land on the surface of the globe; but by far the greatest portion of it is uninhabited, and, it might be added, *uninhabitable;* for far the greatest part of it seems destined to perpetual sterility. The whole extent may be estimated at about 7½ millions of square miles, and its population at about 71¼ millions. Of its population, about 64 millions belong to Europe, more than 7 to Asia, and 17,500 to America.

[b] *Moscow.*—This magnificent city was set fire to by its inhabitants when occupied by the invading army of the French, under Napoleon, in 1812; and two-thirds of it was destroyed. The Kremlin, which contains the ancient palace of the Czars, escaped the conflagration. The city has since been, in a great measure, rebuilt, and with increased splendour.

South Russia comprises the provinces along the Euxine and the Sea of Azov, the most of which formerly belonged to Turkey. It contains 5 governments; and the principal towns are Odessa, Kherson, Nikolaiev, Sevastopol, Kishenau (the capital of Bessarabia), Ismail, Akerman, Bender, and Kertch. The country occupied by the Cossacs is included in this division, but it is under a distinct military government. The Cossacs are divided into several tribes, as the Don Cossacs, the Ural Cossacs, &c.

East Russia comprises the ancient Tartar kingdom of Kasan and Astrakhan, the inhabitants of which are still more than half *Asiatic* in their costumes, manners, &c. They contain 9 governments; and their principal towns are Kasan, Saratov, Astrakhan, and Perm.

PRINCIPAL TOWNS.—*St. Petersburg* the capital, founded by Peter the Great, is one of the finest and most commercial cities in Europe. It is divided into two parts by the Neva, which connects the Lake of Ladoga with the Gulf of Finland. *Cronstadt* is its port, and it is also the principal station of the Russian navy. It is built on a small island 18 miles W. of St. Petersburg, the passage to which it commands. It is strongly fortified. *Riga* has a fine harbour, and is strongly fortified. It ranks next to St. Petersburg in commerce. *Revel* is also a strongly fortified and important commercial town. *Helsingfors*, the present capital of Finland, is an important naval station. It is strongly defended by the batteries of Sweaborg, built on seven small islands which enclose it. It is the seat of a university (removed from Abo), and is also noted for its commerce. *Abo*, at the junction of the Gulfs of Finland and Bothnia, was till 1819, the capital of Finland. It has still a considerable trade.

Moscow, the ancient capital, is the great emporium of the inland trade of the empire. *Odessa*, on the Black Sea, is the chief port of Southern Russia. It is particularly noted for its large exports of grain. It was made a free port in 1817; and it is strongly fortified. *Kherson* has declined in consequence of the preference given to Odessa. It was here that the philanthropic Howard died (in 1790). *Nikolaiev*, on the Boug, before its junction with the Dnieper, has since the destruction of Sevastopol (in 1855), become the chief naval station of Russia on the Black Sea. *Taganrog* on the northern shore of the Sea of Azov, is noted for its extensive exports of grain.

Astrakhan, on an island in the Volga, about 45 miles from its mouth, is the emporium of the trade of the Caspian Sea, and the centre of the maritime commerce of Russia with Persia, and other Eastern countries. *Kasan*, 430 E. of Moscow, and 4 miles from the Volga, has a large trade with Siberia and Tartary. It was formerly the capital of a Turkish khanate to which Russia was tributary. *Nijnii* (or Nishnii).[a] *Novogorod*, at the junction of the Oka with the Volga, is noted for its great fair, which lasts from July to September, and is attended by upwards of 100,000 persons from all parts of Europe and Asia. *Kiev*, on the right bank of the Dnieper, about 500 miles S. W. of Moscow, is one of the oldest and most venerated cities of the empire. It was

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[a] *Novogorod* means *new town*, and *Nijnii* or *Nishni* means *lower*. It was so called to distinguish it from Novogorod, on Lake Ilmen, which was formerly a large and flourishing city, and was in consequence called Novogorod *Veliki* or *the Great*.

here Christianity was introduced among the Russians. *Tula*, about 100 miles S. of Moscow, has been called "the Birmingham of Russia." It is particularly noted for its extensive manufacture of muskets, swords, and bayonets.

POPULATION OF THE PRINCIPAL TOWNS.—The present population of the principal towns of Russia (1860), is nearly as follows:—St. Petersburg, 550,000; Moscow, 355,000; Warsaw, 157,000 (of whom about 35,000 are Jews); Odessa, 85,000; Saratov, 76,000; Riga, 62,000; Kishenau (the capital of Bessarabia), 59,000; Kasan, 58,000; Kiev, 57,000; Vilna or Wilna, 58,000 (of whom a large number are Jews): Nikolaiev, 48,000; Tula, 45,000; Cronstadt, 40,000; Kherson, 38,000; Astrakhan, 34,000; Simferopol (the capital of the Crimea), 33,000; Revel, 30,000; Ismail, 28,000; Nijnii Novogorod, 27,000; Poltava, 22,000; Taganrog, 21,000; Akerman, 20,000; Archangel,[a] 20,000; Smolensk, 18,000; Helsingfors, 17,000; Bender, 16,000; Abo, 14,000.

MOUNTAINS.—The Ural or Uralian Mountains, the Olonetz Mountains, and the Valdai Hills.

RIVERS.—The principal rivers are the Volga, the Don, the Dnieper, the Dniester, the N. Dwina, the S. Dwina, and the Memel or Nieman, the Ural, the Pruth, the Neva, the Petchora.

LAKES.—Ladoga, Onega, Peipus, Ilmen, Bieloe, &c.

ISLANDS.—In the Baltic, Aland, Dago, Oesel; in the Arctic Ocean, Nova Zembla, Spitzbergen, &c.

GULFS, BAYS, STRAITS, &c.—The Gulfs of Bothnia, Finland, and Riga; Archangel Bay, Onega Bay; Straits of Kaffa or Yenikale, and the Straits of Waygatz.

Russia, from its vast extent, is subject to great diversity of SOIL and CLIMATE; but, generally speaking, except in its southern provinces, which are exceedingly fertile, it is a cold and unproductive country.

The SURFACE is generally level, and a great portion of it, particularly towards the north, is covered with lakes, marshes, forests, and barren plains, called *steppes*.

The PEOPLE are rude and uneducated, but great efforts are now making to instruct and civilize them. The great majority of the PEASANTS are still in a state of vassalage to the proprietors of the soil; but the present Emperor is making great efforts to effect their emancipation.

The principal PRODUCTIONS of Russia are timber, tar, pitch, tallow, hides, corn, hemp, flax, iron, copper, furs, potash. It also produces gold, platina, and precious stones.

Russia is principally a corn-growing country, and the great majority of its inhabitants are engaged in *agricultural* pursuits, particu-

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[a] *Archangel* is the most northern port in Europe of any consequence, and was the principal one in Russia till St. Petersburg was founded. It carries on a considerable trade during the summer, but its harbour is frozen during the greater part of the year.

larly in the central and southern provinces. And vast numbers of sheep and oxen are reared on the steppes.

Its MANUFACTURES are still in a backward state, but great efforts are making to improve those which they have, and to introduce others. Their principal manufactures are Russian leather, coarse linen and hempen fabrics, as canvas and sailcloth, cordage, &c. Cotton, woollen, and silk manufactures are also carried on in some of the principal towns, but to no great extent.

REVENUE, &c.—The revenue is about 44 millions sterling; and the DEBT is upwards of 200 millions.

ARMY.—Next to that of France the Russian army is the largest in Europe. It numbers upwards of 450,000 men.

NAVY.—As a *naval* power Russia is the third in Europe.[a]

The ESTABLISHED religion is the Greek Church, but all others have full toleration.[b] The GOVERNMENT is an absolute monarchy. Peter the Great was the founder of this vast empire.

HISTORICAL SKETCH.

Russia, anciently *Sarmatia*, is supposed to derive its name from the *Rossi*, a Slavonic tribe, of whom mention is made in the histories of the ninth century. It was successively occupied by the Scythians, Goths, Vandals, Huns, and the other barbarians, who advanced upon, and ultimately overran the Roman empire. In 862, Ruric, a Scandinavian, having united together the independent states or tribes who possessed the country, became the first monarch of Russia. In 976 Vladamir embraced the religion of the Greek Church,[c] and introduced it among his subjects, who had previously been Pagans. About the year 1237, Batto, Khan of the Mongols, took possession of the empire, and for the space of more than two centuries and a half it remained in a state of subjection to him and his successors. But the independence of the empire was re-established by Ivan Basilovitch, who subdued Astrakhan and other Tartar provinces. In 1696, Peter the Great, by the death of his brother Ivan, became sole monarch of Russia. He assumed the title of Emperor of all the Russias;[d] and it is to this great prince that the present power of Russia is principally due. Before his time the Russians were little better than barbarians. The extraordinary efforts which he made to introduce civilization among them, and to increase and consolidate the power of the empire are well known.

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[a] The *Gotha Almanac* for 1860, states that the nominal army consists of 577,859 men; and the fleet of 158 vessels, of which 73 are steamers. Of the sailing vessels, 12 are line-of-battle ships, and 7 frigates; and of the steamers, 7 are line-of-battle ships, and 11 frigates.

[b] In the Polish provinces most of the inhabitants are Roman Catholics; in Finland, and the provinces once Swedish, they are Lutherans; in South and East Russia, many are Mahometans.

[c] Through the instrumentality of the Greeks of Constantinople.

[d] "All the Russias" refers to the countries called Russia Proper Red Russia, White Russia, and Black Russia.

AUSTRIA.

BOUNDARIES.—Austria is bounded on the north by Saxony, Prussia, and Russian Poland; on the west by Bavaria, Switzerland, and Italy; on the south by Turkey, the Adriatic, and Italy; and on the east by Russia and Turkey (Moldavia).

It extends from 44° to 51° N. L., and from 8° 35′ to 26° 35′ E. L. Its length from east to west is about 850 miles; and its breadth from north to south, 480 miles. Its AREA is upwards of 250,000 square miles, and its POPULATION is about 37 millions.

It is the largest empire in Europe, except Russia, and it comprises under it several nations, which differ in language, laws, customs, and manners.

Austria comprises the Archduchy of Austria, the kingdoms of Bohemia, Hungary (with Slavonia and Croatia), Galicia (with Cracow and the Bukovina), Illyria, and Dalmatia, the Grand Principality of Transylvania, the Duchy of Styria, and the Provinces of Tyrol, Moravia, and Silesia, and Venetia in Italy.

Austria may be divided into four great divisions, namely, the German, the Hungarian (including the Slavonian), the Polish, and the Italian provinces. The *German* provinces comprise Bohemia, Moravia, and Silesia, in the *north;* Salzburg and the Archduchy of Austria, in the *middle;* and Tyrol, Styria, and Illyria (comprising Carinthia, Carniola, and Istria), in the *south.* The *Hungarian* provinces comprise Hungary, Transylvania, Slavonia, Croatia, and Dalmatia, and the Military Frontier. The *Polish* provinces consist of Galicia, Cracow, and the Bukovina. The *Italian* provinces are now reduced to Venetia.

The Archduchy of Austria is the nucleus of the empire, and the seat of the government. It is divided into Upper and Lower Austria by the river Enns.

RACE AND LANGUAGE.—Of the entire population of Austria nearly one-half are Slavonians; more than a fifth are Germans; nearly a fifth are Magyars; and the remainder comprises Italians, Wallachians, Armenians, Albanians, Jews, and Zingari or Gypsies. The *German* race and language prevail in the Archduchy of Austria, and in the greater part of Styria and the Tyrol; the *Slavonic*, in Illyria, Bohemia, Moravia, Silesia, Galicia, Dalmatia, Croatia, and Slavonia. The *Wallachians* are numerous in the Bukovina, Hungary, and Transylvania. They call themselves *Rumani*, and are the descendants of a medley of ancient settlers who colonized Dacia from different parts of the Roman empire. They speak a corrupt Latin dialect. The *Magyars* are a handsome and high-spirited race, of pure Asiatic extraction, akin to the Tartar and the Turk. They are generally the landed proprietors, and the predominant race in most of the Hungarian provinces. Their language is akin to the Finnish. Latin is also spoken by the educated classes. The *Jews*, who amount to upwards of 700,000, are found principally in the Polish provinces, and the *Zingari* or Bohemians, amounting to about 100,000, exist as a wandering people in the Hungarian and Polish provinces.

CHIEF TOWNS.—The chief towns of the great divisions of the Austrian empire, with the POPULATION of each, in round numbers, are as follows:—

Provinces.	*Chief Towns.*	*Population.*
Lower Austria,	Vienna,	480,000
Upper Austria,	Linz,	32,000
Salzburg,	Salzburg,	18,000
Bohemia,	Prague,	145,000
Moravia,	Brunn,	49,000
Silesia,	Troppau,	12,000
Tyrol,	Innsbruck,	17,000
Styria,	Gratz,	59,000
Carinthia,	Klagenfurt,	15,000
Carniola,	Laybach,	19,000
Istria,	Capo d'Istria,	7,000
Illyrian Coast,	Trieste,	100,000
Hungary,	Pesth and Buda,	135,000
Transylvania,	Klausenburg,	22,000
Slavonia,	Essek,	15,000
Croatia,	Agram,	15,000
Dalmatia,	Zara,	7,000
Galicia,	Lemberg,	77,000
Cracow,	Cracow,	55,000
Venetia,	Venice,	110,000

Vienna, the capital of the empire, holds a high rank among the cities of Europe for science, literature, and refinement. *Prague* is the capital of Bohemia, and the second city in Austria. *Presburg* is the ancient, and *Buda* or *Ofen* is the modern capital of Hungary. *Pesth* and *Buda*, which are merely separated by the Danube, may be regarded as forming one city. *Lemberg* or *Leopold*, is the capital of Galicia, in Austrian Poland, and the centre of its trade. *Cracow*, on the Vistula, was formerly the ecclesiastical capital of Poland. It possesses a magnificent cathedral, in which the kings were crowned, and many of them buried. *Trieste* has a spacious harbour, and an extensive commerce; and for a long period was the only port in the Austrian empire. *Gratz*, on the Mur, is the seat of a university, and is noted for its flourishing manufactures, and its extensive iron trade. *Brunn* is noted for its extensive woollen and other manufactures. *Olmutz* and *Troppau* are important fortresses. *Kronstadt* and *Hermanstadt*, in Transylvania, are large and important towns; the population of the former is about 30,000; and of the latter, about 22,000. *Trent* is noted as the place where the last General Council was held. *Salzburg*, in Upper Austria, is famous for its *saltworks*, from which it derives its name. *Tokay*, on the Theiss, is famous for its wine; and *Kremnitz* and *Schemnitz* for their gold and silver mines. *Venice* has declined from her former power and opulence, but is still a magnificent city.

MOUNTAINS.—The Carpathian, and Sudetic Mountains, the Rhætian or Tyrolese, the Carnic, the Noric, the Julian, and the Dinaric Alps. See pages 80, 85, and 86.

RIVERS.—The great river of Austria is the Danube, which flows through the whole country, first in an easterly, next in a southerly, and finally in a south-eastern direction. From the Alps it receives the Enns, the Raab, the Drave, with its tributary the Mur, and the Save; and from the northern mountains, the March, the Waag, and the Theiss. The Elbe, the Oder, the Vistula, and the Dniester are only Austrian in the upper portions of their course.

LAKES.—Zirknitz in Carniola; Balaton Lake or Platten See, and Neusiedler See, in Hungary. See page 99.

The CLIMATE of Austria is, generally speaking, mild and salubrious; and the SOIL, for the most part, fertile, but badly cultivated. Few countries can vie with it in the number and richness of its mines; as the gold and silver of Transylvania and Hungary; the iron of Carinthia and Styria; the copper, iron, and lead, of Galicia; the quicksilver of Carniola; and the celebrated salt mines near Cracow.[a]

A great part of the SURFACE is mountainous, particularly in Styria, Carinthia, and Carniola; but in Hungary and Austrian Poland there are immense plains.[b]

AGRICULTURE is in a backward state; and COMMERCE, owing to the small extent of the sea coast, is necessarily limited; and the MANUFACTURES are neither numerous nor important.

The predominant and established RELIGION is Roman Catholic, but all others are tolerated.

The present Emperor has recently (1860), promised to confer equal religious liberty upon all classes of his subjects; and he also seems disposed to place Austria among the *constitutional* monarchies of Europe. See page 200.

Of the entire population of Austria nearly two-thirds are Roman Catholics; one-sixth of the Greek Church; and one-ninth Protestants.[c] The Protestants are chiefly in Hungary and Transylvania.

The MILITARY force of the empire is about 400,000, and can be greatly increased in the event of a war; but the NAVAL force of Austria is, as we should expect, very small.

The annual REVENUE is estimated at about £30,000,000; and the public DEBT is upwards of £100,000,000.

The manners of the Austrians differ little from those of their German neighbours; but in literature, and general information, they are inferior to most of the German states. The Hungarians are a brave and high-spirited people.

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[a] See the general observations on the minerals of Europe, page 198.

[b] See Chapter VII., and note [b], page 92.

[c] According to an official statement, there were in the Austrian empire in 1851, 26,357,172 Roman Catholics; 6,856,701 Greeks; 3,501,455 Protestants; and 729,005 Jews. Since this, Lombardy has ceased to belong to the empire, the population of which is upwards of 3,000,000.

HISTORICAL SKETCH.

The Archduchy of Austria formed a part of the ancient *Pannonia*, the *Vindobona* of the Romans being the modern Vienna. *Noricum*, and the country of the *Quadi*, were the Roman names of the other parts of Austria. It was called *Austria*, that is, the *eastern* kingdom with reference to France, under Charlemagne. who was crowned, in the year 800, Emperor of the West. Germany was ruled by French princes till 912, when Conrad, Count of Franconia, was elected king. Otho the Great conquered Bohemia and Italy, and in 962 assumed the title of Emperor of Germany and King of Italy. In 1273, Rodolph, Count of Hapsburg, the founder of the house of Austria, was raised to the Imperial throne. In 1477, the Emperor Maximilian having married Mary, heiress of Charles Duke of Burgundy, the Netherlands became subject to the Austrian empire; and by the marriage of his son, Philip, with Jane, daughter of Ferdinand and Isabella of Spain, in 1496, the crown of Spain became attached to the house of Austria. In 1516, Charles V., grandson of Maximilian, succeeded to the throne of Spain, and in three years after to the Imperial crown. On his resignation, Spain and the Netherlands devolved to his son, Philip II.; and Austria. Bohemia, and Hungary, to his brother, Ferdinand, who was shortly after elected Emperor of Germany. In 1740, the male branch of the house of Austria became extinct by the death of Charles VI., and the right of his daughter, Maria Theresa, to the crown, under the "Pragmatic Sanction," was disputed, in a war in which most of the powers of Europe were involved. This was terminated in 1748, in the Peace of Aix-la-Chapelle, when the right of Maria Theresa was acknowledged, and her husband, the Duke of Lorraine, was raised to the Imperial throne under the title of Francis I. In 1806, Francis II. was obliged by Napoleon, who conquered the most of his dominions, to resign the title of Emperor of Germany, and to take in its stead that of Emperor of Austria. See Historic Sketch of Germany.

PRUSSIA.

BOUNDARIES.—Prussia comprises a large portion of Northern Germany. It is bounded on the north by the Baltic, Mecklenburg-Schwerin, Denmark, and Hanover; on the west by France, Belgium, and Holland; on the south by Austria, Saxony, and the Minor German States; and on the east by Russia and Russian Poland.

It extends from about 49° to 56° N. L., and from 6° to 23° E. L. Its greatest length from E. to W. is 715 miles; and its breadth from N. to S varies from 80 to 350 miles. Its area is about 108,000 square miles; and its population is upwards of 17 millions.

Prussia is very irregular in shape; and two of its provinces, namely, Westphalia and Rhenish Prussia, are entirely separated from the rest of the kingdom. Several small portions of Prussian Saxony are also detached from the rest, and in the heart of other German States. This want of compactness is a great disadvantage to Prussia; and it obliges her to keep a much greater standing army than would otherwise be necessary.

Prussia is divided into eight provinces, which are subdivided into 25 regencies or governments. Each regency takes its name from the chief city within its bounds.

Provinces.	*Chief Towns.*	*Population.*
East Prussia, . .	Königsberg, ...	80,000
West Prussia, . .	Dantzic, ...	66,000
Posen, ...	Posen, ...	45,000
Brandenburg, . .	Berlin, ...	470,000
Pomerania, . . .	Stettin, ...	55,000
Silesia, ...	Breslau, ...	133,000
Prussian Saxony, .	Magdeburg, ...	60,000
Westphalia, . .	Munster, ...	28,000
Rhenish Prussia, .	Cologne, ...	120,000

Six of these divisions are in Germany, namely, Brandenburg, Pomerania, Silesia, Prussian Saxony, Westphalia, and Rhenish Prussia; and two of them are beyond the limits of Germany, namely, East and West Prussia, or Prussia Proper, and Posen. *Brandenburg*, which was the original patrimony of the reigning family, forms the nucleus of the kingdom. *Prussia Proper* forms the eastern part of the kingdom. It first belonged to the Teutonic Knights, afterwards to Poland, and lastly to the Electors of Brandenburg, by whom it was raised from a duchy to a kingdom (in 1701). *Posen* is a part of the ancient kingdom of Poland.

The small principalities of Hohenzollern-Sigmaringen, and Hohenzollern-Hechingen, in Germany, were made over to Prussia in 1849. Sigmaringen is the capital of the former, and Hechingen of the latter.

PRINCIPAL TOWNS.—*Berlin*, on the Spree, the capital of Prussia, and one of the most beautiful cities in Europe. *Potsdam*, a few miles from Berlin, is noted for the royal palace of *Sans-Souci*, the favourite residence of Frederick the Great. It is the head-quarters of the Prussian army. *Breslau*, on the Oder, is the second city in Prussia in point of population; and it is also noted for its extensive trade and great wool fair. *Königsberg*,[a] at the mouth of the Pregel, is the capital of Prussia Proper. It has a great trade in corn and timber. It was here Frederick, Elector of Brandenburg, crowned himself King of Prussia (in 1701). *Dantzic*,[b] near the mouth of the Vistula, is the chief seat of the foreign commerce of Prussia. It is strongly fortified. *Magdeburg*, on the Elbe, is one of the strongest fortresses in Europe. It has extensive manufactures of cottons, woollens, porcelain, &c. *Frankfort*, on the Oder, has important manufactures, and extensive commerce. *Cologne* is the principal seat of commerce on the Rhine, and is celebrated for its cathedral. It is here that the famous "Eau de Cologne" is made. *Aachen* or *Aix-la-Chapelle*, 30 miles west from Cologne, is noted for two important treaties of peace concluded there, and also for its baths. *Coblenz*[c] is situated at the confluence of the Rhine with the Moselle, and is the great depot for the Rhenish wines. *Treves*, on the Moselle, the most ancient city in Germany, is noted for its Roman remains. *Dusseldorf*, a large handsome town, at the confluence of the

[a] *Königsberg* means *King's town*. [b] *Dantzic* means *Danish town*.

[c] *Coblenz* or *Coblentz* owes its name to its situation. It is a corruption of the Latin word *Confluentes* (flowing together).

Dussel with the Rhine. It is the river port for the cotton and silk manufactures of Elberfield, Barmen, &c.

SEAPORTS.—The principal *seaports* are Dantzic, Königsberg, Stettin, Memel, Elbing, Stralsund, Colberg, and Pillau, which may be regarded as the port of Königsberg, and Elbing.

RIVERS.—The principal rivers flowing into the Baltic, are the Memel or Niemen, the Pregel, the Vistula, the Oder, with its tributary, the Wartha; and into the North Sea or German Ocean, the Rhine, the Elbe, and the Ems. None of these rivers rise in Prussia.

GULFS.—The Gulf of Dantzic, at the mouth of the Vistula; Frische-Haff, which is separated from the Gulf of Dantzic by a long narrow peninsula; Curische[a]-Haff, an inlet of the same kind, at the mouth of the Memel; and Gross-Haff, at the mouth of the Oder.

ISLANDS.—Rugen, Usedom, and Wollin, in the Baltic.

SURFACE AND SOIL.—The *surface* of the Prussian states is generally flat. The mountain-tracts are the Hartz in Saxony, and the Riesen-gebirge on the south-west confines of Silesia. The *soil* in general is poor, particularly in Brandenburg and Pomerania, large portions of which consist of sandy steppes, and barren heaths. Rhenish Prussia and Silesia are the most fertile provinces.

CLIMATE.—The climate in the *western* or Rhenish provinces is *mild*; in the Baltic or northern, *moist*; and in the *eastern*, or the parts near Russia and the Carpathian Mountains, *cold*.

MINERALS.—Prussia is not rich in minerals,[b] but *iron* is abundant, and extensively worked in the Rhenish provinces, and Silesia. *Coal* is also abundant in the Rhenish provinces, Saxony, and part of Silesia. *Copper* also is found in considerable quantities. *Amber* has long been known as a product of Prussia. It is found principally along the low tongue of land between the Curische-Haff and the sea.

COMMERCE.—The commerce of Prussia is considerable. The principal exports are corn, wool, timber, iron, flax, linen, and woollen cloths, Westphalia hams, &c.

EDUCATION.—Prussia can boast of possessing the most complete and best organized system of national education existing in Europe. In fact, the whole people may be said to be educated; for if parents fail to send their children to the schools established by the State, they must satisfy the authorities that they are receiving a suitable education at home, or in private seminaries. In addition to numerous Normal schools and academies, there are seven universities, namely, those of Berlin, Breslau, Halle, Bonn, Königsberg, Munster, and Greifswalde.

Since the time of Frederick the Great, much attention has been devoted to MILITARY tactics; and, in fact, it is to the great number,

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[a] *Curische-Haff*, that is, the *haven* of *Courland*.
[b] See the general observations on *minerals*, page 198.

high discipline, and well-known bravery of her soldiers that the power of Prussia is principally due. The regular army amounts to upwards of 150,000; and the *landwehr* or militia to upwards of 400,000. The NAVAL force of Prussia is very small.

The RELIGION is Protestantism, but all denominations of Christians have perfect toleration, and are equally eligible to places of trust and emolument.

The Prussians being composed of different races, present a great variety in their characters and customs, but, in general, they are like their German neighbours.

HISTORICAL SKETCH.

Prussia is supposed to derive its name from the *Pruzzi*, a Slavonic tribe, who occupied the country after the Goths. The Pruzzi were, in 1227, subdued by the Teutonic Knights, who, when the Crusades in Palestine failed, waged war against the Pagans in the north of Germany. About 1446, the four principal cities in Prussia, Elbing, Thorn, Königsberg, and Dantzic withdrew their allegiance from the Teutonic Knights, and placed themselves under the protection of Poland. The sovereignty of Prussia thus passed to Poland, which continued to possess it till 1656, when Frederick William, usually called the Great Elector, compelled the King of Poland to declare Prussia an independent state. In 1688, he was succeeded by his son, Frederick, who made himself King of Prussia in 1701, having put the crown upon his own head. His grandson, Frederick the Great, began to reign in 1740, who, by the energy of his character, and his extraordinary talents, both as a statesman and a warrior; raised Prussia to the rank of one of the "Five Great Powers of Europe."

POLAND.

Poland as an independent monarchy has long since ceased to appear in the map of Europe. Before its first partition by Russia, Austria, and Prussia, it was bounded on the north by the Baltic and Prussia; on the west by Germany; on the south by Hungary and Turkey; and on the east by Russia. Its length from east to west was about 700 miles; and its breadth from north to south 600 miles. Its AREA was upwards of 250,000 square miles; and its POPULATION was estimated at about 12 millions.

DIVISIONS.—Poland comprised three great provinces or governments, which were subdivided into 32 palatinates. The three great provinces were Great Poland in the north-west, Lithuania in the north-east, and Little Poland in the south.

CHIEF TOWNS.—Warsaw, Cracow, Dantzic, Thorn, Elbing, Leopold or Lemberg, Grodno, &c.

RIVERS.—The Vistula, the Memel or Niemen, the Dwina, &c.

MOUNTAINS.—The Carpathian Mountains, between it and Hungary. See page 85 for a description of these mountains.

PARTITION OF POLAND.—Russia obtained the provinces of Kour-

land, Samogitia, Lithuania, Masovia, Polesia, Volhynia, Ukraine, and Podolia. To *Prussia* fell Polachia, Polish Prussia, and Great Poland; and to *Austria*, the large province or kingdom of Galicia. Russia and Austria have since taken possession of the remaining portions of Poland. See the last two paragraphs of this page.

HISTORICAL SKETCH.

About the year 550 this country was taken possession of by the Sclavonians (or Slavonians), who were the last of the barbarous tribes from the East who settled in Europe. The name of their leader was Lesko. In the year 700, the people gave the supreme command to Cracus under the name of duke. He was the founder of *Cracow*. His posterity failing in 830, a peasant named Piast was elected duke, who became the founder of a royal dynasty.

In 965, Christianity was introduced into Poland; and in 1384, Jagellon, Grand Duke of Lithuania, who had married the Princess of Poland, was elected king; and because he united his dominions to Poland, the crown was made hereditary to his family. In 1572 the crown became elective on the death of Sigismund Augustus, the last prince of the line of Jagellon. The first choice fell upon Henry of Valois, brother to Charles IX., King of France; but he succeeding to the crown of France, resigned that of Poland; and Stephen Bathori, Prince of Transylvania was elected his successor. The succeeding contests for the crown of Poland were most injurious to the country; and in the end, fatal to the monarchy; for on the death of each king the country was generally involved in a war between contending factions who were supported by foreign powers.

The Poles were engaged in frequent wars with the Russians and the Turks; and they were obliged to become tributary to the latter, till, by the valour of *John Sobieski*, they were relieved from the humiliating obligation. In 1683, the Poles, under this victorious general, whom they had elected as their king, saved *Vienna*—and perhaps all Europe from the Turks, who were then in the zenith of their power.

The last king of Poland was Stanislaus Augustus Poniatowski, who was elected in 1764, through the influence of Catharine II., Empress of Russia. A great part of the Polish nation denying the validity of the election, civil dissensions arose which served as a pretext for the felonious intervention of Russia, Prussia, and Austria, who, on this occasion, appropriated to themselves one-third of the ancient kingdom of Poland. This took place in 1772; and in 1795, the remainder of the country was taken possession of by the same powers, notwithstanding the heroic resistance of the gallant *Kosciusko*.

In 1807, Napoleon united a great part of ancient Poland under the name of the Grand Duchy of Warsaw; but in 1814 the greater part of it was transferred to Russia by the Congress of Vienna, under the name of the Kingdom of Poland, of which the Emperor of Russia was to be king. In 1830 the Poles made a heroic attempt to regain their independence; but being finally subdued in the following year, Poland was constituted an integral part of the Russian empire.

In 1846, the free city or small republic of Cracow, the last remnant of ancient Poland was taken possession of by Austria, and in this spoliation Russia and Prussia concurred.

GERMANY.

Boundaries.—Germany is bounded on the north by the German Ocean, Denmark, and the Baltic; on the west by France, Belgium, and Holland; on the south by Switzerland, Italy, the Adriatic, and Istria; and on the east by Prussia, Posen, Poland, Galicia, Hungary, and Croatia.

It extends from 44° 46′ to 55° 53′ N.L., and from about 6° to 20° E.L. Its length from east to west is about 680 miles; and its breadth from north to south, about 600 miles. Its AREA in square mile is estimated at 245,000; and its POPULATION is about 44 millions.

Germany is divided into 35 distinct and independent states, which are united under the name of the Germanic Confederation,[a] the business of which is conducted by a *Diet*[b] composed of representatives from each state. The meetings of the Diet are held at Frankfort on the Maine, the capital of the Confederation. Austria is the principal state, and Prussia is the second; and the next in importance are, Bavaria, Wurtemberg, Hanover, Saxony, and the Grand Duchy of Baden.

About three-fifths of the area and population of Germany belong to Austria and Prussia, and in nearly equal proportions. Their German provinces have been already described.

The Grand Duchy of Luxembourg is attached to the Kingdom of the Netherlands; and the Duchy of Holstein to Denmark.

The other German States comprise 4 Kingdoms, 6 Grand Duchies, 7 Duchies, 1 Electorate, 8 Principalities, 1 Landgravate, and 4 Free Cities. See page 194.

Each of the German States is obliged to contribute troops to the army of the Confederation in fixed proportions; and the full amount of their separate contingents makes up an army of 303,493 men. To the Federal army the contingent of Austria is 94,822; of Prussia, 79,484; of Bavaria, 35,600; of Wurtemberg, 13,955; of Hanover, 13,054; of Saxony, 1,200; of Baden, 10,000; of Hesse-Cassel (Electorate), 5,679; of Hesse-Darmstadt, 6,195; of Nassau, 4,039; of Den-

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[a] The object and obligations of the Germanic Confederation are to maintain internally and externally the independence and integrity of each of the German States.

[b] The total number of votes in the Diet is 70, but on ordinary occasions only 17 votes are taken. Of these Austria, Prussia, Bavaria, Saxony, Hanover, Wurtemberg, Baden, Electorate of Hesse, G. D. of Hesse, Denmark (for Holstein and Lauenburg), and Holland (for Luxembourg), have each one vote; while the remaining six votes are partitioned among the Minor States, two or more of which must join in one vote. At the meetings of the Diet, Austria presides, but has no greater power than the other members, except a casting vote when there happens to be an equality. When fundamental laws are to be made or altered, the Diet resolves itself into a general assembly, in which each state votes individually; and in which a majority of two-thirds is required to accomplish any change.

mark, for Holstein and Lauenburg, 3,600; of Mecklenburg-Schwerin, 3,580; of Oldenburgh and Kniphausen, 2,829; of Holland for Luxembourg, 2,536; of Brunswick, 2,096; of Saxe-Weimar, 2,010; of Hamburg, 1,298; of Saxe-Coburg-Gotha, 1,116.

The following German States are the next in extent and importance to Austria and Prussia.

States.	*Chief Towns.*
Kingdom of Bavaria, .	Munich, Nuremburg, Augsburg, Ratisbon, Wurzburg, Bamberg, Passau, Spires.
Kingdom of Wurtemberg,	Stuttgard, Ulm, Hailbron, Hall.
Kingdom of Hanover, .	Hanover, Hildsheim, Gottingen, Emden.
Kingdom of Saxony. .	Dresden, Leipsic, Freyburg, Chemnitz.
Grand Duchy of Baden, .	Carlsruhe, Mannheim, Freyburg, Heidelberg, Constance, Baden-Baden.
Electorate of Hesse-Cassel,	Cassel, Hanau, Fulda, Marburg.
G. D. of Hesse-Darmstadt,	Darmstadt, Mentz (or Mayence), Worms.
Grand Duchy of Mecklenburg-Schwerin,	Schwerin, Rostock, Wismar.
G. Duchy of Oldenburg, with Kniphausen, .	Oldenburg, Delmenhorst, Kniphausen.
Duchies of Holstein and Lauenburg, . . .	Gluckstadt, Kiel, Altona.
Duchy of Nassau, . .	Wisbaden, Biberich, Limburg, Ems.
Duchy of Brunswick, .	Brunswick, Wolfenbuttel, Helmstadt.
G. Duchy of Saxe-Weimar,	Weimar, Eisenach, Jena.
D. of Saxe-Coburg-Gotha,	Gotha, Coburg.

Of the above German States the following are the largest and most important:—

States.	*Area.*	*Population.*	*States.*	*Area.*	*Population.*
Bavaria, . .	29,637,	4,615,748	Baden, .	5,913,	1,335,952
Hanover, . .	14,833,	1,843,976	Hesse-Cassel, .	4,435,	726,739
Wurtemburg, .	7,651,	1,690,898	Hesse-Darmstadt,	3,758,	845,571
Saxony, . .	5,771,	2,122,148	Holstein, &c., .	3,726,	573,003

The united areas of the remaining German States amount to about 10,000 square miles, and their population to about a million and a half. See page 194 for their names, &c.

The most of the Minor German States resemble our COUNTIES in extent, population, and resources. They may be described as lying generally about the Maine and the upper part of the Weser. They are confined on the north by Hanover, on the south by Bavaria and Baden, on the west by Rhine Prussia, and on the east by Prussia and Saxony. Mecklenburg-Schwerin lies on the Baltic, to the east of Holstein; and Mecklenburg-Strelitz to the south-east of Schwerin. Oldenburg lies to the west of the mouth of the Weser, within the kingdom of Hanover.

Of the free cities, Lubeck, Hamburg, and Bremen, are frequently called *Hanse Towns*, from a Teutonic word signifying a *league*. This league was formed in the thirteenth century by the chief commercial cities in Germany, in order to defend their property against the rapacity of the feudal lords; to clear the seas from pirates, and the high-

ways from robbers. They were very powerful. Lubeck was the capital of the Hanse Towns; but Hamburg has long since taken the lead.

CHIEF CITIES.—In addition to the chief cities in Austrian and Prussian Germany, may be mentioned *Munich*, the capital of Bavaria, a large and beautiful city. It contains splendid galleries of paintings and sculpture, and is distinguished for its literary institutions. *Dresden*, the capital of Saxony, is a beautiful city, and the seat of the arts in the north of Germany. It is distinguished for its royal library, museum, and gallery of pictures. The beautiful porcelain called "Dresden china," is manufactured at *Meissen*, 15 miles from Dresden. They are both on the Elbe. *Stuttgard* and *Hanover* are important only as the capitals of their respective kingdoms. *Carlsruhe*, the capital of Baden, is beautifully situated. It is built in the form of an outspread fan, or rather wheel, round the ducal palace, from which the streets issue, like the *radii* of a circle. *Frankfort*, on the Maine, is the seat of the German Diet, and the centre of the inland trade of Germany. *Hamburg*, on the Elbe, about 70 miles from its mouth, is the chief port of Germany, and one of the most commercial cities in Europe. *Cuxhaven*, at the mouth of the Elbe, in a small territory belonging to Hamburg, is much frequented as a packet station, &c.

The other principal *seaports* belonging to Germany are Bremen, Lubeck, Stettin, Altona, Embden, and Trieste.

There are many other important and distinguished cities in Germany; as *Leipsic*, celebrated for its great book trade and fairs,[a] its university; and also for the defeat of Napoleon by the Prussians and Austrians in 1813; *Augsburg*, where the Protestant Confession of Faith was presented to Charles V.; *Ulm*, formerly one of the imperial cities of Germany; *Heidelberg*, famous for its great tun, which holds 600 hogsheads; *Weimar*, distinguished for its library and literary establishments; *Gottingen*, in Hanover, celebrated for its university; *Gotha*, a beautiful city on the declivity of a hill, which is crowned by the palace of Friedenstein. It contains fine libraries, museums, and galleries of paintings; *Coburg*, a large and distinguished town; *Nuremberg*, a large and populous city; *Ratisbon*, an ancient and wealthy city,—with several others.

POPULATION OF THE CHIEF TOWNS.—The population of the principal towns in Germany, not already given, are as follows:—Munich, 140,000; Hamburg, 135,000;[b] Dresden, 120,000; Leipsic, 76,000; Frankfort, on the Maine, 69,000;[b] Bremen, 62,000;[b] Nuremberg, 60,000; Aix-la-Chapelle, 58,000; Hanover, 54,000; Stuttgard, 48,000; Dusseldorf, 48,000; Barmen, 46,000; Elberfield, 44,000; Brunswick, 43,000; Chemnitz, 42,000; Mentz or Mayence, 40,000; Augsburg, 40,000; Potsdam, 35,000; Cassel (Electorate), 35,000; Altona, 34,000; Lubeck, 30,000;[b] Ratisbon, 28,000; Carlsruhe, 27,000; Ulm, 25,000; Treves, 20,000.

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[a] It has three fairs in the year, which last a fortnight each. They are attended by merchants from almost every country in Europe, and even from Asia; and at the Easter fair, by nearly 600 booksellers. It is the great emporium of the book trade in Germany.

[b] The population of Hamburg, including the small territory attached, is about 225,000; of Bremen, 90,000; of Frankfort, 82,000; and of Lubeck, 55,000.

MOUNTAINS.—The Alps between Tyrol and Bavaria, the Harz Mountains, Erz-gebirge, Riesen-gebirge, Black Forest Mountains, &c. See page 86.

RIVERS.—The Danube, Rhine, Elbe, Weser, Ems, Maine, Neckar, Iser, Inn, &c.

LAKES.—Boden See or Lake Constance, Schwerin, &c.

Germany may be divided into *Northern*, *Middle*, and *Southern*. In Northern Germany, particularly near the Baltic, the country is flat, and abounds in shallow lakes, marshes and plains of sand. The SOIL is not generally very productive, and the CLIMATE is cold and moist.

Middle Germany is traversed by mountains of moderate height, which are rich in minerals. The soil is in general very productive; and the climate is so mild that the wine grape is cultivated in the valleys.

Southern Germany, south of the Maine, is an elevated, hilly country, abounding in fertile and beautiful valleys. The principal productions are corn, wine, and minerals. The climate, except in the valleys, is not so mild as in Middle Germany.

HISTORICAL SKETCH.

Ancient Germany was inhabited by a number of warlike tribes, chiefly of Gothic or Teutonic origin. They were distinguished by their fierce, persevering, and often successful resistance to the encroachments of the Romans, by whom, even in the plenitude of their power, they were never completely subjugated. The descendants, and even the names of some of the most distinguished of these tribes, exist at the present day; as the *French* from the *Franks*; and the *English* from the *Anglo*-Saxons.

In the year 800, the celebrated Charlemagne, King of France, re-established the Empire of the West; and thus the whole of Germany became subject to his sway. The Franco-Germanic empire founded by Charlemagne, continued till the death of Louis III., the last prince of his line. This occurred in 912; and upon this occasion, the Five Nations of Germany, as they were then called, the Franks, the Swabians, the Bavarians, the Saxons, and the Lorrainers, determined to choose an emperor for themselves. They accordingly, in a public assembly convened for the purpose, elected Conrad, Count of Franconia, son-in-law of the deceased monarch. Conrad was, therefore, properly speaking, the first Emperor of Germany; and from this period the empire became elective, which often led to bitter contentions, and most destructive wars.

At first, the emperors were chosen by the princes, the lords, and the deputies of cities; but the right of election was afterwards restricted to an Electoral College, which consisted of nine members, namely, the Archbishops of Mentz, Trèves, and Cologne, and the Electors of Bohemia, Saxony, Brandenburg, the Palatinate, Bavaria, and Hanover. These electors were sovereign princes, and they were subject to the emperor only as the head of the great federal body, of which he was sometimes the least powerful member.

In 1272, Rodolph of Hapsburg, a Swiss nobleman, was elected

emperor. He acquired for his family the provinces of Austria, Styria, and Carniola; and thus became the founder of the house of Austria. In 1437, Albert, duke of Austria, was elected emperor, and since his time (till the abolition of the title in 1806), the emperors of Germany were chosen from his family. Albert married the daughter of Sigismund, the preceding emperor, and thus added to his patrimonial possessions the kingdoms of Hungary and Bohemia, and other provinces in the north and east of Germany. This accounts for the power and influence of the house of Austria in Germany till of late years. The great rival of Austria at present is Prussia.

In 1806, Francis II. was obliged by Napoleon to resign the crown and title of Emperor of Germany, and to assume the title of Emperor of Austria. This put an end to the German Empire, and in its stead, the minor princes, some of whom were made kings, were formed into an association, called the Confederation of the Rhine, at the head of which Napoleon placed himself under the title of Protector; and in less than a year after, he obliged them to become his allies against the Prussians, &c. After the downfall of Napoleon in 1814, the Germanic Confederation was established as it exists at present. See page 253.

SWEDEN AND NORWAY.

The kingdoms of Sweden and Norway form one European power under the same crown. The great peninsula of which they consist is bounded on the north by the Arctic Ocean; on the west by the Atlantic and German Oceans; on the south by the Skager Rack, the Cattegat, the Sound, and the Baltic; and on the east by the Baltic, the Gulf of Bothnia, and Russia. Sweden occupies the eastern part of it, and Norway the western; and the general boundaries between them are successive chains of mountains which extend under various names through the whole length of the peninsula. See page 87.

SWEDEN.

The length of Sweden from north to south is about 1,000 miles; and its breadth from east to west is about 200 miles.

Its AREA in square miles is upwards of 170,000; and its POPULATION in 1855 was 3,639,332.

Sweden is divided into three great divisions, formerly called kingdoms, which are subdivided into 24 läns or governments.

Divisions.	*Principal Towns.*
Sweden Proper, . .	Stockholm, Upsal, Gefle, Fahlun.
Gothland, . . .	Gottenburg, Carlscrona, Norrköping, Malmö, Calmar, Helsingborg.
Norrland, . . .	Hernosand, Sundsvall, Umea.

CHIEF TOWNS.—*Stockholm*,[a] the capital, is built on several small

[a] *Stockholm.*—The name given to this city evidently refers to its position, and the mode in which it must have been built. *Holm* signifies an island, formed by a river, and *stock* is another form of the word

islands and peninsulas, at the junction of Lake Mælar with the Baltic. It has a safe and capacious harbour, and extensive trade. Its arsenal is famous. *Gottenburg*, on the Cattegat, ranks next to Stockholm for commerce and population. *Upsal* is celebrated for its university.[a] *Carlscrona* has considerable trade, and is the principal station of the Swedish navy. *Malmö*, in the Sound, is strongly fortified. *Helsingborg*, opposite to Elsinore, is the nearest point to Denmark. *Fahlun* is noted for its copper mines. *Norrköping* and *Gefle* are places of considerable trade. *Calmar* is famous as the place in which the treaty for the union of the three kingdoms was concluded in the year 1397.

The *population* of the principal towns in Sweden, in 1859, was as follows:—Stockholm, 101,502; Gottenburg, 30,576; Norrköping, 18,062; Malmö, 16,823; Carlscrona, 14,513; Gefle, 9,000; Calmar, 6,500; Fahlun, 5,200; Upsal, 5,000; Nyköpeng, 3,500; Sundsvall, 2,000; Hernosand, 2,000.

ISLANDS.—In the Baltic, Gothland and Oland; and in the West Indies, the small island of St. Bartholomew.

RIVERS.—The Dahl, the Lulea, and the Tornea, flow into the Gulf of Bothnia; the Motala, into the Baltic; and the Göto or Gotha, into the Cattegat.

LAKES.—The principal lakes are Wener, Wetter, and Mælar.

ARMY AND NAVY.—The Swedish army consists of 26,700 infantry, 8,000 cavalry, 5,140 artillery—in all about 40,000 men. The naval force consists of 21 ships of the line, 8 frigates, 8 brigs, and 250 small vessels.

The soil of Sweden is in general very unproductive; and scarcely one-twentieth part of the country is capable of cultivation. The chief wealth is derived from its *mines*[b] and *forests*. Its *fisheries* are also extensive and valuable.

HISTORICAL SKETCH.

Sweden was originally occupied by the *Fins*, and afterwards by the *Goths*, &c. Hence the names *Finmark*,[c] *Finland*, *Gothland*, *Gottenburg*,[d] &c. In 1397, it was, with Norway, united to Denmark under the celebrated Danish Queen Margaret. It remained subject to Den-

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stake. In such sites, the foundations of buildings are supported by *stakes* or timbers driven into the earth. See the observations on *Amsterdam*, page 263.

[a] It is from the observatory of *Upsal* that the Swedish geographers reckon longitude.

[b] The annual produce of the mines of Sweden is about 100,000 tons of iron, 1,200 tons of copper, and 1,000 lbs. of silver. The best iron is procured from the mines of Dannemora, 30 miles north from Upsal; and the most celebrated copper mines are at Fahlun, in Dalecarlia.

[c] *Finmark*.—That is, the boundary (*march*) or country of the *Fins*. Compare *Denmark* (of the *Danes*.)

[d] *Gottenburg*, or rather *Gothenburg*.—That is, the stronghold or town (*burg*) of the *Goths*. The present king of Sweden, at his accession to the throne, was proclaimed "King of Sweden and Norway, and of the *Goths* and *Vandals*."

mark till 1523, when it recovered its independence under the famous Gustavus Vasa. Among the succeeding monarchs, Gustavus Adolphus, and Charles XII., were the most celebrated. In 1810, Bernadotte, one of Napoleon's generals, was elected king; and in 1814, Norway was wrested from Denmark by the Allied Sovereigns, and added to Sweden. See the Historical Sketch on Denmark.

NORWAY.

Its length from the Naze to Nordkün is upwards of 1,000 miles; and its breadth, from east to west, varies from 50 to 250 miles. Its AREA in square miles is about 122,000; and its POPULATION in 1855 was 1,490,047.

Norway may be divided into Norway Proper or Southern Norway, and Norrland or Northern Norway. *Norway Proper* contains the four provinces of Aggerhuus or Christiania, Christiansand, Bergen, and Drontheim. *Norrland* comprises that part of Norway north of Drontheim, with Finmark or Norwegian Lapland.

Provinces.	*Chief Towns.*
Aggerhuus *or* Christiania, .	Christiania, Frederickshalld, Frederickstadt, Kongsberg, Drammen.
Christiansand, . . .	Christiansand, Stavanger, Arendal.
Bergen, ...	Bergen.
Drontheim, . . .	Drontheim, Röraas
Norrland, ...	Hammerfest, Tromsoe.

CHIEF TOWNS.—*Christiania*, the capital or seat of government, is the best built town in the kingdom, and has extensive commerce. *Bergen* is the second city in the kingdom in point of population, and the first in commerce. It is a naval station. *Drontheim* or *Trondheim*, the ancient capital, and residence of the Norwegian kings, is a place of considerable commerce. *Frederickshalld* is noted for its strong fortress, at the siege of which Charles XII. of Sweden was killed (in 1718). The other towns of Norway are very small; as Frederickstadt, Kongsberg, Röraas, Arendal, and Hammerfest. The latter is the most northerly town in Europe. It is on Qualöe (or *Whale Island*), 60 miles S. W. of the North Cape. The population is about 400. The houses are made of wood, painted externally. It has a considerable trade in stockfish, whale, and seal oil, &c.

The *population* of the principal towns in Norway are as follows:—Christiania, 40,000; Bergen, 30,000; Trondheim or Drontheim, 18,000; Stavanger, 12,000; Drammen, 10,500; Christiansand, 10,000; Frederickshalld, 8,000; Kongsberg, 5,000; Röraas, 4,000.

ISLANDS.—The Loffoden Isles and Mageroe on the north; Hitteren and Vigten Isles on the west, &c.

BAYS.—West Fiord and Drontheim Bay on the west; and Christiania Bay on the south.

MOUNTAINS.—The Dovre-field Mountains, &c. See page 88.

RIVERS.—The Glommen, Drammen, and Louven, into the Skager Rack; and the Tana and Alten, into the Northern or Arctic Ocean.

LAKES.—The lakes are numerous. Miosen is the largest.

ARMY AND NAVY.—The army of Norway is about 10,000 infantry, 1,000 cavalry, 1,000 artillerymen, and 150 engineers. The naval force consists of 5 brigs, and 117 gun-boats.

Norway is a rugged and mountainous country, possessing, however, numerous valleys, and large tracts of great fertility, particularly in the south.[a] A rugged chain of mountains separates it from Sweden; and the coasts are indented with *fiords* or inlets of the sea, and covered with rocky islands. The scenery is more diversified than Sweden with mountains, forests, valleys, lakes, rivers, precipices, and cataracts. The climate resembles that of Sweden; but it is neither so cold in winter, nor so warm in summer.

The chief wealth of Norway is derived from its mines,[b] forests, and fisheries. Its rocky coasts and islands are inhabited by numerous birds, which supply the eider-down of commerce.

Among the Loffoden Isles is the celebrated and dangerous whirlpool called the *Mælstrom*. See page 110.

The Norwegians are a simple, but a brave, frank, and hospitable people. Education is in a backward state, but efforts are making to promote it. Most of the peasantry manufacture their own clothing, tools, and furniture.

HISTORICAL SKETCH.

Norway was originally peopled by the *Fins* and *Laps*, who in after times were driven to the northern extremities by the *Goths*. In 875, Harfager or the *Fair-haired*, united the petty states of Norway into one monarchy, and from that period (except during the time it was subject to Canute the Great, in 1028), it was governed by its own kings till the year 1397, when it was annexed to Denmark by the famous Union of Calmar. In 1814 it was annexed to Sweden by the Congress of Vienna; but it is still a distinct kingdom, and governed by its own laws. See the Historical Sketch on Denmark.

LAPLAND.

LAPLAND occupies the northern extremity of Europe. Though partitioned among Norway, Sweden, and Russia, it is considered as one country, on account of the peculiar character and habits of the people. The population of the whole of Lapland amounts to about 20,000; but the *Laplanders* themselves do not amount to more than 7,000. The other occupants are Russians, Swedes, and Norwegians.

The chief towns are *Tornea* in Swedish, and *Kola* in Russian Lapland. But the Laplanders generally live in huts, or lead a wandering and barbarous life. They profess Christianity, but they are very ignorant of the Scriptures, and retain many Pagan superstitions. They are dwarfish in stature, seldom exceeding four feet and a-half in height.

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[a] Scarce one-hundredth part of the country is under, or is, perhaps capable of cultivation.

[b] The iron-mines of Arendal, the copper-mines of Röraas, and the silver-mines of Kongsberg, are the most productive.

The chief wealth of the Laplanders is the *rein-deer*. In the winter they carry on some traffic with the Swedes at Tornea, and other places on the Gulf of Bothnia. They exchange at this season, skins, furs, dried fish, venison, and gloves, for flannel, cloth, hemp, copper, iron, and various utensils, but particularly for spirituous liquors, meal, salt, and tobacco.

DENMARK.

DENMARK is bounded on the north by the Skager Rack; on the west by the German Ocean; on the south by Germany; and on the east by the Cattegat, the Sound, and the Baltic.

Its length from the Skaw to the Elbe, is 300 miles; and its breadth, from Copenhagen to the German Ocean, is about 180 miles. Its area in square miles is about 22,000; and its population is upwards of 2½ millions.

Denmark is partly a continental, and partly an insular kingdom. Its continental territory consists of the peninsula of Jutland, and the Duchies of Sleswick, Holstein, and Lauenburg; and its principal islands are Zealand and Funen at the entrance of the Baltic. Holstein and Lauenburg form a part of the Germanic Confederation.

Divisions.	*Chief Towns.*
Jutland Proper, or North Jutland, ...	Aalborg, Aarhuus, Viborg.
Sleswig, or South Jutland,	Sleswig, Flensborg.
Holstein, ...	Altona, Kiel, Gluckstadt, Rendsburg.
Lauenberg, ...	Lauenburg, Ratzeburg.
Island of Zealand, . .	Copenhagen, Elsinore.
Island of Funen, . .	Odensee, Nyborg.

CHIEF TOWNS.—*Copenhagen*, the capital, and residence of the king, is situated on a fine harbour on the east coast of the island of Zealand. *Altona*, on the Elbe, ranks next in population and commerce. *Kiel*, the capital of Holstein, is celebrated for its university.

Elsinore, on the east coast of the island of Zealand, at the narrowest part of the Sound, the passage of which is commanded by the castle or fortress of Krongberg in the vicinity.

ISLANDS.—The other islands are Langland, Falster, Laaland, Bornholm, &c., in the Baltic.

STRAITS.—The Sound, the Great Belt, and the Little Belt.

RIVERS.—The *Elbe*, which forms the southern boundary of Denmark; and the *Eyder*, which separates Holstein from Sleswick, and by means of the canal of Kiel connects the Baltic with the German Ocean.

CAPES.—The *Skaw*, in the north of Jutland.

ARMY AND NAVY.—The Danish army consists of about 25,000 men, with a large reserve of landwehr, or militia. The naval force consists of 6 line-of-battle ships, 7 frigates, 5 corvettes, 4 brigs, and several gun-boats.

FOREIGN POSSESSIONS.—Iceland and the Faroe Isles, in the Atlantic; the Islands of St. Thomas, St. Croix, and St. John, in the

West Indies; part of the coast of Greenland in the Arctic Ocean; and some forts and settlements on the coast of Guinea, in Africa, of which Christiansborg is the chief.

The AREA of Iceland is estimated at 37,800 square miles; and its POPULATION, in 1855, was 64,603. The chief, and only town is *Reykiavik*. The Faroe Islands are 22 in number, of which 17 are inhabited. The POPULATION of them is under 10,000. *Thorshaven*, in Stromoe, is the principal town.

Continental Denmark, and particularly Jutland, forms a long continued plain, with few elevations, or rising grounds. The small river *Eyder* is the only one of importance; but rivulets, brooks, and small lakes, are numerous. The *climate* is moist, but temperate, and generally healthy. The *soil* is in general fertile, and well adapted to pasturage; but in the north of Jutland there are large barren tracts covered with heath and sand.

HISTORICAL SKETCH.

The peninsula of Jutland, which was called the *Chersonesus Cimbrica* by the Romans, was at that period occupied by the *Cimbri*, a German tribe, but originally from the East. Little is known of Denmark till the 8th century after the Christian era. About the beginning of this century, and for two hundred years after, they, and their neighbours, the Norwegians, were notorious for their piracies, and for their predatory descents upon the coasts of England, France, Flanders, and Germany. They were then known by the name of Nordmans, Northmans, or Normans; and they called themselves *Vikings* or Sea-kings.

In 832, they landed in England, and established themselves in a portion of it; and subsequently, they were for a time in possession of the whole kingdom. See page 282. In 911, under Rollo or Rolf, their celebrated leader, they made a descent upon the northern coast of France; and gave their name to *Normandy*. See page 240. They subsequently proceeded to Spain, Italy, and Sicily, spreading terror wherever they went, by their courage, ferocity, and rapacity.

In the year 1000, Sweyn, a warlike prince, conquered a part of Norway; and in 1013, he invaded England, and took possession of a portion of it. Having died the year after, his son Canute completed his conquests, and became king of Denmark, Norway, and England. Under Canute, the power of Denmark reached its highest point, and he was deservedly called the "Great." The sovereigns after him were little distinguished till Margaret, who was called "the Semiramis of the North," ascended the throne. She was daughter of Waldemar III., King of Denmark, and wife of Hakon VI., King of Norway. Upon the death of her son in 1387, she was crowned queen of both kingdoms. The Swedes, dissatisfied with their king Albert, offered her the crown, which she, having defeated Albert, accepted. She then effected the famous *Union of Calmar*, by which the three kingdoms became united under one crown. This wise and heroic princess reigned 26 years over Denmark and Norway, and 16 over Sweden. In 1523, the Union of Calmar was broken, and Sweden regained her independence; but Norway continued to be annexed to Denmark.

In the Revolutionary War with France, Denmark identified herself

with the interests of Napoleon; and she was, in consequence, treated with great severity by England. In 1807, her capital was bombarded by a British fleet, and her fleet seized and carried off; and at the pe..ce of 1814, she was obliged to cede the island of Heligoland to Britain in exchange for some West India islands; and Norway to Sweden in exchange for Swedish Pomerania, and the island of Rugen. In the following year Denmark gave Pomerania and Rugen to Prussia in exchange for Lauenburg, and a pecuniary consideration. In 1848, the Duchies of Sleswig and Holstein revolted, and after a short war matters were arranged by the Great Powers on condition that they are to retain their own distinct institutions, and not to be incorporated with Denmark or each other.

HOLLAND OR THE NETHERLANDS.

HOLLAND[a] is bounded on the north and west by the German Ocean; on the south by Belgium; and on the east by Rhenish Prussia and Hanover.

Its length from north to south is 160 miles; and its breadth from east to west, 110 miles. Its AREA in square miles (including the Dutch portion of Luxemburg and Limburg), is 13,600; and its POPULATION in 1859, was 3,543,775.

The kingdom of Holland is divided into 10 provinces:—

Provinces.	*Chief Towns.*
North Brabant,	Hertogensboch or Bois-le-Duc, Tilburg, Breda, Bergen-op-Zoom.
Guelderland,	Arnheim, Nimeguen, Zutphen.
North Holland,	Amsterdam, Haarlem, Horn, Alkmaar.
South Holland,	The Hague, Rotterdam, Leyden, Dort, Schiedam, Briel, Delft.
Zeeland,	Middleburg, Flushing.
Utrecht,	Utrecht, Amersfort.
Friesland,	Leeuwarden.
Overyssel,	Zwoll, Deventer, Kampen.
Groningen,	Groningen.
Drenthe (Drent),	Meppel, Assen.
G. Duchy of Luxemburg,[b]	Luxemburg, Limburg, Maestricht, Venloo.

CHIEF TOWNS.—*Amsterdam*, the capital, on the *Amstel*, is one of the most commercial cities in Europe. The site of the city is marshy, and the houses are built on piles or timbers, driven deep into the earth. *Rotterdam* is next to Amsterdam in population and commerce. These cities are intersected in all directions by canals. The *Hague* is a beautiful city, and the seat of government. *Leyden* is celebrated for

[a] *Holland*, called also the *Netherlands*. See note, page 91.

[b] The Grand Duchy of Luxemburg is the German territory of Holland. It consists partly of Luxemburg, and partly of Limburg. It is detached from the other Dutch possessions, and is surrounded by Prussia, Belgium, and France. The western part of Limburg belongs to Holland, and is connected with it on the south-east.

its university; and *Utrecht* is memorable for its treaties.[a] The *Briel* or *la Brielle*, is a handsome and strongly fortified town. The capture of the Briel is famous in Dutch history.

ISLANDS.—Over Flakee, Voorn, Texel, Vlieland, Ter Schelling, Ameland, which belong to the province of Holland; and Walcheren, N. Beveland, S. Beveland, which form the province of Zeeland.

SEAS AND BAYS.—Zuyder Zee, Haarlem Mer, Lauwer Zee, Dollart Bay, and the Y, a branch of the Zuyder Zee.[b]

RIVERS.—The Rhine, with its branches, the Waal, Yssel, and Leck;[c] the Meuse or Maese, the Scheldt or Escaut, &c.

FOREIGN POSSESSIONS.—In the West Indies, Curaçoa, Buen Ayre, St. Eustatius, and part of St. Martin; in the East Indies, Java, and the Moluccas or Spice Islands, with settlements in Sumatra, Borneo, and Celebes; in South America, Dutch Guiana or Surinam; and in Africa, El Mina, and several small forts on the coast of Guinea.

The Dutch colonies rank next in importance to those of the British empire. Their united area is estimated at 700,000 square miles, and their population at 15,000,000.

ARMY AND NAVY.—The army consists of 58,000 men; and the navy of 5 ships of the line, and 81 smaller vessels, carrying in all 1,740 guns.

Holland, as its name implies, is a low flat country. In fact, the greater portion of it is below the level of the sea, from which it is only preserved by enormous dykes or embankments.[d] Viewed from an

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[a] One in 1579, uniting the Seven United Provinces against the Spaniards; and another in 1713, terminating the wars of the Spanish succession.

[b] The Zuyder Zee was formerly a large inland lake (the *Flevo* of the ancients), through which the Rhine passed on its way to the ocean, between the islands of Vlieland and Ter Schelling; but, in the course of time, the sea made great inroads on the land, and at length totally submerged all that part of the country which joined the province of Holland to those of Guelderland and Overyssel.

[c] The Rhine, on its entrance into Holland, throws off two branches, the *Waal*, which unites with the Maese, and the *Yssel*, which falls into the Zuyder Zee. The Rhine further divides itself into the *Leck*, &c., and at length finds its way into the sea near Leyden, after having been nearly lost in the sands. The Scheldt receives the Lys at Ghent; and the Maese the Sambre, at Namur. No country in Europe, in proportion to its extent, has so many rivers as Holland.

[d] The dykes are generally 30 feet high, and 70 feet broad at the bottom. They are made of clay, fenced on the land side with wood and stone, and next the sea with mats of rushes or flags, or with sea-weed, which is found to be the best protection against the waves. There are men whose constant business is to keep them in thorough repair. But, notwithstanding every precaution, the sea sometimes

eminence, it presents the appearance of a vast plain, intersected by innumerable canals, which not only drain the country, but render it navigable in all directions. The tame monotony of the prospect is however relieved by the rich and verdant appearance of the country, interspersed with comfortable farm-houses, neat cottages, and elegant villas. The scene, too, is enlivened by the number of boats and ships which seem to be sailing through the country, amid trees and villages.

The CLIMATE in the south is mild, but in the north moist and foggy, and in winter very cold. At this season the canals are generally frozen over, but they are still used as modes of travelling. The people skate along them with surprising rapidity, and it is quite usual to see country girls proceeding to market in this way with baskets of eggs or other articles on their heads.

The Dutch are as remarkable for their enterprise abroad as they are for industry and perseverance at home. Their COMMERCE extends to all parts of the world; and their MANUFACTURES are extensive and valuable. The fine linens of the south, and the earthenware of the north have long been celebrated.

HISTORICAL SKETCH.

In the time of the Romans Holland was inhabited chiefly by the *Batavii* and *Frisii*. After the fall of the Roman Empire it was seized by the Goths and other northern hordes, who divided it into several petty states. It was conquered by Charles Martel in the eighth century, and subsequently formed a part of the dominions of Charlemagne. From the tenth to the fourteenth century the Netherlands were divided into many petty sovereignties, under the dukes of Brabant, the counts of Holland and Flanders, &c. In 1383, by marriages, and otherwise, the whole became subject to the dukes of Burgundy; and subsequently to the house of Austria; and thence it passed into the possession of Spain. In 1579, seven of the provinces threw off the yoke of Spain, and formed themselves into the "Republic of Holland, or the Seven United Provinces," under a supreme magistrate, called the *Stadtholder* or Defender of the State. The seven united provinces were Holland, Friesland, Groningen, Overyssel, Utrecht, Guelderland, and Zeeland. The other ten provinces remained subject to Spain till transferred to the German branch of the house of Austria in 1700. See the Historical note on Belgium.

BELGIUM.

BELGIUM is bounded on the north by Holland; on the west by the German Ocean; on the south by France; and on the east by Dutch Luxemburg and Limburg, and Rhenish Prussia.

Its length, from east to west, is about 150 miles; and its breadth, from north to south, is about 120 miles. Its AREA in square miles is 11,500; and its POPULATION in 1859, was 4,623,089.

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breaks in and inundates the neighbourhood. In 1568, some of the islands of Zeeland, a great part of the coast of Holland, and almost all Friesland, were laid under water. In this inundation 72 villages were destroyed, and more than 20,000 persons drowned.

Belgium, including a portion of the Duchies of Limburg and Luxemburg, consists of nine provinces.

Provinces.	*Chief Towns.*
South Brabant, . .	Brussels, Louvain, Tirlemont.
Antwerp, ...	Antwerp, Mechlin or Malines.
West Flanders, . .	Bruges, Ostend, Courtray, Ypres.
East Flanders, . . .	Ghent, St. Nicholas, Lokeren, Alost, Oudenarde, Dendermonde.
Hainault, ...	Mons, Tournay, Charleroi.
Liege, ...	Liege, Verviers, Spa.
Namur, ...	Namur, Dinant.
Belgian Limburg, . .	Hasselt, St. Tron, Tongres.
Belgian Luxemburg, .	Arlon, Bastogne.

CHIEF TOWNS.—BRUSSELS, the capital, is one of the most beautiful cities in Europe. It is famous for its manufactures, particularly of lace and carpets. *Antwerp* is the most commercial place in Belgium, and was formerly the first city in Europe for commerce. *Ghent* ranks next to Antwerp in commerce and importance. *Liege* is noted for its university, and extensive manufactures. *Bruges* is an important commercial city *Ostend* is the principal, and almost the only port of consequence in Belgium. *Mons* and *Namur* are important and strongly fortified towns. *Louvain* is the principal university in Belgium. About seven miles to the south of Brussels, on the edge of the Forest of Soigné, is the village of WATERLOO.

RIVERS.—The Scheldt or Escaut; the Maese or Meuse, with its tributary, the Sambre.

In Belgium the face of the country is generally level, but it occasionally presents a pleasing variety of gentle eminences. It is traversed by canals, but they are less numerous than in Holland.

The CLIMATE is mild, but inclined to moisture. The SOIL is in general fertile, and so highly cultivated, that Belgium has been called the Garden of Europe.

The MANUFACTURES of Belgium are numerous and important. Those of lace, cambric, and woollen, are celebrated. Its COMMERCE was formerly important, but it has greatly diminished.

HISTORICAL SKETCH.

The original inhabitants were *Celts*; but in the time of the Romans the country was occupied by the *Belgæ*, a German tribe. After the time of Charlemagne, Belgium, or Flanders, as it was then called, became subject to the counts of Flanders; next to the dukes of Burgundy; and subsequently to the house of Austria. Up to the revolt of the Seven Provinces, its history is much the same as that of Holland. Napoleon annexed it to France in 1795, but it was in 1814 taken from France, and joined with Holland, to form the kingdom of the Netherlands. This kingdom was broken up by the Revolution in 1830 into the present kingdoms of Belgium and Holland; and Leopold, Prince of Saxe-Coburg was elected King of the Belgians.

SPAIN.

SPAIN is bounded on the north by the Pyrenees and the Bay of Biscay; on the west by Portugal and the Atlantic; and on the south and east by the Mediterranean.

Its length from Cape Creux to the most western point of Galicia is 640 miles; and its breadth from the Bay of Biscay to the Straits of Gibraltar, 530 miles. Its AREA in square miles is estimated at 182,270; and its POPULATION amounts to nearly 13 millions.

DIVISIONS.—Spain was formerly divided into 14 great provinces, but since 1833 it has been subdivided into 49 smaller provinces or governments, each of which except four[a] takes its name from the chief town within its boundary. Two of the modern provinces consist of the Balearic and Canary Islands. The old provinces are better known, and more referred to. They are as follows:—

FOUR NORTHERN PROVINCES.

Provinces.	*Chief Towns.*
Galicia,	Corunna, Santiago, Ferrol, Vigo.
Asturias,	Oviedo, Gijon.
Biscay,[b]	Bilboa, Vittoria, St. Sebastian.
Navarre,	Pampeluna, Tudela, Estella.

FOUR EASTERN PROVINCES.

Arragon,	Saragossa, Teruel, Huesca.
Catalonia,	Barcelona, Tortosa, Tarragona.
Valencia,	Valencia, Alicant, Murviedro.[c]
Murcia,	Murcia, Carthagena, Lorca.

FOUR MIDLAND PROVINCES.

Leon,	Valladolid, Salamanca, Leon.
Old Castile,	Santander, Burgos, Segovia, Avila.
New Castile,	Madrid, Toledo, Talavera.
Estremadura,	Badajoz, Merida.

TWO SOUTHERN PROVINCES.

Granada,	Granada, Malaga, Almeria, Ronda.
Andalusia,	Seville, Cadiz, Cordova, Xeres.[d]

CHIEF TOWNS.—*Madrid* is important only as the capital of the Spanish monarchy. It is situated on a plateau about 2,000 feet above the level of the sea. *Barcelona* is the second city in Spain for population and the first in commerce, manufactures, and wealth. *Seville* was formerly the capital of Spain, and is still a large and handsome city.

[a] Namely, Navarre, Biscay, Alava, and Guipuzcoa, which retain their ancient denominations. Their chief towns are Pampeluna, Vittoria, Bilboa, and St. Sebastian.

[b] This province is sometimes divided into Biscay, Guipuzcoa, and Alava. They are called the *Basque* provinces.

[c] *Murviedro* is on the site of the ancient *Saguntum*.

[d] *Xeres.*—Hence *sherry* wine takes its name.

Cadiz (the ancient *Gades*), a naval and commercial port on the island of Leon. Its harbour is strongly fortified. It has declined greatly since the defection of the Spanish American colonies. *Valencia* is celebrated for its manufactures, and has a considerable trade, though it can scarcely be said to have a harbour. *Granada* was the capital of the Moorish kings, and contains the celebrated Alhambra. *Carthagena* is said to have been built by Asdrubal, the Carthaginian general. It has a fine harbour, and is one of the three naval stations of Spain. *Saragossa*, the ancient *Cæsarea Augusta*, is famous for its resistance to the French in 1808–9. *Malaga* is a large and important commercial town, with a capacious harbour. *Ferrol* is an important naval station. Its harbour is unrivalled in Europe for extent, depth, and safety. *Corunna* is noted for its safe and spacious harbour. *Vigo*, on a fine bay further to the south, is now preferred to Corunna as a packet station for England, &c. *Murcia*, *Cordova*, *Badajoz*, and *Toledo*, are among the most distinguished ancient cities. *Salamanca* has long been celebrated for its university. *Gibraltar*, one of the strongest fortresses in the world, has belonged to Britain since 1704.

POPULATION OF THE CHIEF TOWNS.—The population of the principal towns are as follows:—Madrid, 300,000; Barcelona (including Barcelonette), 250,000; Seville, 155,000; Murcia, 120,000; Malaga, 115,000; Saragossa, 85,000; Granada, 75,000; Valencia, 74,000; Cadiz, 73,000; Carthagena, 35,000; Xeres, 34,000; Santiago, 30,000; Alicant, 25,000; Corunna, 20,000.

ISLANDS.—The Balearic Islands, Majorca, Minorca, Iviza, Formentera, Leon (on which Cadiz is built); and the Canary Islands, the principal of which are Teneriffe, Grand Canary, and Palma.

Palma in Majorca, and *Port Mahon* in Minorca, are the principal towns in the Balearic Islands. *Santa Cruz*, in Teneriffe, is the capital of the Canary Islands.

MOUNTAINS.—The Pyrenees, &c. See page 83.

RIVERS.—The Minho, Douro, Tagus, Guadiana, Guadalquiver, flowing into the *Atlantic*; the Ebro, Xucar, and Segura, into the *Mediterranean*; and the Bidassoa into the Bay of Biscay. It forms part of the boundary between France and Spain.

COLONIES.—Almost the only remains of the vast foreign possessions of Spain are the islands of Cuba and Porto Rico, in the West Indies; and the majority of the Philippine Isles, in the Indian Archipelago.

Next to Switzerland, Spain is the most mountainous country in Europe. It is traversed from east to west by several rugged chains, and its centre, comprising a large portion of the two Castiles, consists of an extensive plateau or table land, nearly 2,000 feet above the level of the sea. It abounds in fertile and beautiful valleys, and in grand and picturesque scenery. Its CLIMATE is, generally speaking, very hot, but dry and healthy. In the elevated regions it is cool and pleasant in summer, but very cold in winter. In the north, and about the sea-coast, it is mild and agreeable. The SOIL is in general very fertile, but badly cultivated. See page 83.

HISTORICAL SKETCH.

Spain was known to the ancients by the names of *Hispania* and *Iberia*. It was also, from its *western* situation, called *Hesperia*.

Spain, it is supposed, was originally peopled by the *Iberians* and other Asiatic tribes, traces of whose race and language exist to this day in the Basque Provinces. The Phœnicians at a very early period established colonies in it, as *Gades* (Cadiz); and the Carthaginians subsequently took possession of a great part of it. The Romans drove the Carthaginians from it, and ultimately converted it into a province of their empire.

Upon the breaking up of the Roman Empire it was taken possession of by the Vandals, Suevi, and Alans; and subsequently, by the Visigoths or *Western* Goths (in 477), who erected it into a very powerful kingdom, which existed till the invasion and conquest of the country by the Saracens or Moors in 713. The Moors overran all Spain, except the northern provinces and mountainous districts, and their descendants kept possession of the best part of the country for nearly 800 years. They were finally conquered and driven from Spain by Ferdinand and Isabella (in 1492).

PORTUGAL.

PORTUGAL is bounded on the north and east by Spain, and on the west and south by the Atlantic.

Length, from north to south, 368 miles; breadth, from the Rock of Lisbon to the borders of Spain, 140 miles. Its AREA in square miles is upwards of 35,000; and its POPULATION amounts to about 4 millions.

Portugal is divided into six provinces, which, with their principal towns, are as follows:—

Provinces.	*Chief Towns.*
Entre Douro e Minho,	Oporto, Braga, Viana.
Tras-os-Montes,	Braganza, Chaves, Miranda, Villa Real.
Beira,	Coimbra, Almeida, Castelbranco.
Estremadura,	Lisbon, Setubal or St. Ubes, Santarem, Torres Vedras, Cintra, Vimiero.
Alemtejo,	Evora, Elvas.
Algarve,	Faro, Tavira, Lagos.

CHIEF TOWNS.—*Lisbon*, the capital, on the right bank of the Tagus, and *Oporto* at the mouth of the Douro, are the only two great cities which Portugal contains, and they divide between them nearly the whole of its commerce. The population of the former is upwards of 240,000; and of the latter, about 80,000. *Coimbra* and *Setubal* are next in size. The former is the seat of the only university in Portugal; and the latter is noted for its manufacture, and exportation of salt.

CAPES.—Cape Roca or the Rock of Lisbon, Espichel, in Estremadura, St. Vincent, St. Maria.

MOUNTAINS.—Sierra d'Estrella, &c. See page 83.

RIVERS.—Minho, Douro, Mondego, Tagus, Guadiana.

COLONIES.—The Cape Verde Islands, the Azores or Western Islands, the Madeiras; and settlements in Angola, Benguela, and Mozambique, in Africa; also Goa, on the coast of India, Macao, near Canton, and part of the island of Timor, in the East Indies.

HISTORICAL SKETCH.

The ancient name of Portugal[a] was *Lusitania*, but the boundaries are somewhat different. Connected geographically with Spain, it, in early times, shared the same fate, and was successively subject to the Romans, the Suevi, the Goths, and the Moors. In the year 1139, the two kingdoms became distinct, when Count Alphonso, of the house of Burgundy, having defeated the Moors in the great battle of Ourique, was proclaimed by his victorious troops king of Portugal. He was therefore the first king of Portugal, and during his dynasty, which continued till 1580, the country rose to the highest point of political and commercial eminence. The early and extensive discoveries of the Portuguese in Africa, India, Brazil, &c., are well known.

In 1580, on the failure of the royal line, Philip II., king of Spain, took possession of the kingdom; but in 1640, a revolution took place, and the crown was conferred on John, Duke of Braganza (John IV.), whose descendants are still in possession of it. The invasion of Portugal by the French in 1807, the consequent emigration of the queen, Maria I., with the whole of the royal family, to Brazil, the expulsion of the French from Portugal by the British, &c., and the replacement of her son on the throne of Portugal, are well known.

ITALY.

ITALY is bounded on the north by the Alps, which separate it from Switzerland and Austria; on the west by France and the Mediterranean; on the south by the Mediterranean; and on the east by the Adriatic.

Its length from Cape Leuca to Mont Blanc, is about 700 miles; and its breadth varies from 350 to less than 20. Its AREA, including Sicily and the other islands, is about 122,000 square miles; and its POPULATION is upwards of 24 millions.

Previous to the year 1859, Italy comprised eight sovereign and independent states, namely, in the *south*, the Kingdom of Naples,[b] including the Island of Sicily; in the *middle*, the Ecclesiastical States, or territories of the Pope; in the *north-west*, Piedmont, Savoy, and Genoa, which, with the Island of Sardinia, constituted the Kingdom of Sardinia; and in the *north-east*, or between the Po and Ticino, the Gulf of Venice and the Alps, was Austrian Italy or the Lombardo-Venetian States. The Duchies of Tuscany, Lucca,

[a] Its present name is derived from an ancient town on the Douro, near the site of *Oporto*, called *Calle*. It implies the *Port* of *Calle*, or the *western* port. See note, page 233.

[b] It is usually called the Kingdom of the Two Sicilies.

Modena, and Parma, lie between the Sardinian and Ecclesiastical States. The small republic of San Marino is within the Ecclesiastical States; and the petty principality of Monaco is within the Sardinian. But in consequence of the late war, and the revolutions to which it gave rise, great political changes have taken place in Italy; and the country is still in an unsettled state. At present the King of Sardinia holds the Kingdom of Lombardy, under the guarantee of France; and he is also in possession of the Duchies of Parma and Modena, and the Grand Duchy of Tuscany (including the Duchy of Lucca), the greater portion of the States of the Church, and the whole of the Kingdom of the Two Sicilies. And Savoy and Nice, the former the nucleus of the Kingdom of Sardinia, now form an integral part of the empire of France.

POLITICAL DIVISIONS IN 1859.

Kingdom of Naples.	*Chief Towns.*
Naples, ...	NAPLES, Capua, Barri, Reggio, Taranto, Salerno, Gaeta, Foggia, Brindisi.
Sicily, ...	Palermo, Messina, Catania, Girgenta, Marsala, Trapani, Syracuse.
Kingdom of Sardinia.	
Savoy, ...	Chambery, Annecy, Chamouni.
Piedmont, . . .	Turin, Alessandria, Asti, Coni, Casale, Vercelli, Susa.
Genoa, ...	Genoa, Savona, Spezzia.
Nice, ...	Nice, Villafranca.
Island of Sardinia, .	Cagliari, Sassari.
Austrian Italy.	
Milan, ...	MILAN, Mantua, Cremona, Pavia, Lodi.
Venice, . . .	VENICE, Verona, Padua, Vicenza.
States of the Church, .	ROME, Bologna, Ferrara, Perugia, Ancona, Ravenna, Civita Vecchia, Tivoli, Loretto.
Tuscany with Lucca, .	FLORENCE, Leghorn, Pisa, Sienna, Lucca.
Modena, . . .	Modena, Massa, Carrara, Reggio.
Parma, . . .	Parma, Piacenza.
Principality of Monaco,	Monaco.
Republic of San Marino, .	St. Marino.

CHIEF TOWNS.—*Rome*, once the capital of the world, is still a magnificent city. Its splendid buildings and architectural ruins are every where celebrated. *Naples* surpasses every city in Europe for the beauty of its appearance and situation. *Turin* is a handsome city in a fine situation, and is noted for its silk manufactures. *Florence* is a beautiful city, and distinguished as a seat of science and art, and for its noble collection of paintings and statues. *Genoa*, formerly the capital of a republic of the same name, is one of the most commercial ports in Italy. *Leghorn* is next to *Genoa* in commercial importance. *Bologna* is the second city in the Roman States, and is famous for its sausages. *Ancona*, in the same states, has a good harbour, and considerable trade.

Milan and *Venice*, in Austrian Italy, are large and magnificent

cities. And there are many other large and noble cities in Italy; as Padua, Verona, Mantua, Modena, &c.

Population of the Chief Towns.—The population of the principal towns in Italy and the islands belonging to it is as follows:—Naples, 420,000; Palermo, 200,000; Milan, 180,000; Rome, 180,000; Turin, 140,000; Genoa, 120,000; Florence, 115,000; Venice, 114,000; Messina, 85,000; Leghorn, 85,000; Bologna, 80,000; Catania, 58,000; Padua, 55,000; Verona, 54,000; Parma, 44,000; Ancona, 38,000; Nice, 35,000; Bergamo, 35,000; Vicenza, 34,000; Ferrara, 33,000; Mantua, 30,000; Piacenza, 30,000; Modena, 30,000; Cremona, 30,000; Cagliari, 30,000; Pavia, 28,000; Sassari, 28,000; Foggia, 26,000; Lucca, 25,000; Sienna, 25,000; Marsala, 25,000; Trapani, 25,000; Barri, 22,000; Perugia, 20,000; Chambery, 18,000.

Islands.—Besides Sicily and Sardinia, already mentioned, there are Malta, Corsica, Elba, and the Lipari Isles.

The chief towns of Corsica are, Bastia, Ajaccio, and Bonifacio; and the capital of Malta is Valetta.

Gulfs, &c.—Venice, Trieste, Genoa, Gaeta, Salerno, Squillace, Taranto, Bay of Naples, Straits of Messina, Bonifacio, Otranto.

Capes.—Passaro, Spartivento, Leuca, Colonne.

Mountains.—Alps, Apennines, Vesuvius; and in Sicily, Mount Etna. See page 79, &c.

Rivers.—The Po, Adige, Ticino, Arno, Tiber, Volturno.

Lakes.—Maggiore, Lugano, Garda, Como, &c.

Italy is a mountainous, but a rich, beautiful, and picturesque country. Its climate is delightful, and its sky clear and unclouded. The heat, however, in many places is very oppressive in summer; and the *malaria* at that season renders large tracts of it uninhabitable; as the Tuscan Maremme, the Pontine Marshes, and the Campagna di Roma. The south of Italy is subject to the sirocco from Africa. See page 126.

HISTORICAL SKETCH.

Rome was founded by Romulus, from whom it took its name, about 750 years before the Christian era. It was at first governed by kings, of whom there were seven; subsequently by consuls chosen annually by the people; and in the end by emperors. The regal power was abolished (B.C. 508) in consequence of the tyranny and crimes of Tarquinius Superbus and his family; and the consular or democratic form of government then established, continued from that period till the time of Julius Cæsar, who, by making himself perpetual dictator (B.C. 48), usurped the sovereign authority. After him Augustus and a long line of emperors succeeded.

Rome was at first very small, but the daring and martial spirit of its inhabitants, originally either adventurers or outlaws, soon gave it an ascendancy over the petty states by which it was surrounded. They were constantly at war; and almost every war in which they were engaged brought them an accession of territory and power, till in the end they established their dominion over the whole of Italy. Elated with success, the warlike Romans became ambitious of foreign conquests; and the fertile island of Sicily, then the granary of the Cartha-

ginians, was the first territory out of Italy which they became desirous of possessing. This led to the celebrated Punic wars, which terminated in the destruction of Carthage (B.C. 146). Having subdued their powerful and hated rivals, the Carthaginians, the spirit of conquest led the victorious Romans from country to country, till the whole world became subject to their sway. About the period of the Christian era the Roman power was at its height, but it soon after began to decline; and in the fifth century (476) the *Heruli*, under their king or leader, Odoăcer, took possession of Rome and Italy, and thus put an end to the Roman empire in the west. Odoacer reigned as "king of Italy" for seventeen years, when he was slain by Theodoric the celebrated king of the Ostrogoths or Eastern Goths. Theodoric established the kingdom of the Goths in Italy; and having embraced Christianity, he reigned at Rome with great wisdom and moderation till his death (A. D. 526). In about twenty-six years after, Justinian by his generals, Belisarius and Narses, recovered Italy from the Goths, and annexed it to the Eastern empire under an exarch or viceroy, who resided at Ravenna. Narses was the first exarch.

In 568, the Lombards invaded Italy under their king or leader Alboin, and having conquered the greater part of the north of it, established the kingdom of Lombardy. In 753, the Lombards were successfully attacked by Pepin king of France; and in 772, their king dom in Italy was entirely overthrown by his son Charlemagne, who afterwards annexed Italy to the empire of the west, which he re-established. See the Historical Sketches of France and Germany.

The Eastern empire continued to exist till about the middle of the fifteenth century (1453), when Constantinople was taken by the Turks.

SWITZERLAND.

SWITZERLAND is bounded on the north by Germany; west by France; south by Italy; and east by Austria.

Its length, from Mount Jura to the Tyrol, is about 200 miles; and its breadth, from Como to the Rhine at Schaffhausen, is 130 miles. Its AREA in square miles is upwards of 15,000; and its POPULATION amounts to nearly 2,500,000.

Switzerland consists of 22 CANTONS, which are united into one political body called the Swiss Confederation.

Cantons.	*Chief Towns.*	*Cantons.*	*Chief Towns.*
Basle or Bâle,	Basle.	Geneva,	Geneva.
Argovia or Aargau,	Aarau.	Pays-de-Vaud,	Lausanne.
Zurich,	Zurich.	Neufchatel,	Neufchatel.
Schaffhausen,	Schaffhausen.	Fribourg,	Fribourg.
Thurgau,	Frauenfeld.	Berne,	Berne.
St. Gall,	St. Gall.	Soleure,	Soleure.
Appenzell,	Appenzell.	Lucerne,	Lucerne.
Unterwalden,	Stantz.	Glarus,	Glarus.
Uri,	Altorf.	Valais,	Sion.
Zug,	Zug.	Grisons,	Coire.
Schweitz.	Schweitz.	Ticino or Tessin,	Lugano.

CHIEF TOWNS.—*Berne* is the chief town of the largest canton, and the capital of the whole. It is the seat of the diet, and the residence of the ministers from Foreign States. *Geneva* is beautifully situated on the lake of the same name, and is celebrated for its literary institutions, and the distinguished men it has produced. It is also noted for its extensive manufacture of gold watches. *Basle* or *Bâle* and *Zurich* are two of the most commercial towns. *Lausanne* is an interesting town on the side of the Alps, about 1,000 feet above the level of the sea. *Schaffhausen* is near the celebrated fall of the Rhine, and is noted for its trade.

MOUNTAINS.—The Alps, the loftiest summits of which on the Swiss side are Mount Rosa, Mount Cervin, Jungfrau, Schrek-horn, Great St. Bernard, the Simplon, St. Gothard, Mount Jura. Mont Blanc is in the neighbourhood of Switzerland (between Savoy and Piedmont). See page 80.

RIVERS.—The Rhine, Rhone, Aar, Ticino, Inn, &c.

LAKES.—Geneva, Constance, Zurich, Lucerne, Neufchatel, Thun, Brienz, Wallenstadt, Maggiore, Lugano, &c.

RELIGION.—In eight of the cantons the Roman Catholic religion is established; in seven, the Protestant; and in the remaining seven, both these forms of religion exist together.

LANGUAGE.—The Swiss speak French, German, or Italian, as they border on those several countries.

Switzerland is the most elevated and the most mountainous country in Europe, and has long been celebrated for the diversity, beauty, and sublimity of its scenery. Its lofty mountains, covered with eternal snow, and its glaciers or seas of ice, contrast beautifully with its fertile valleys, its picturesque lakes, and its crystal streams. See page 80.

HISTORICAL SKETCH.

The inhabitants of ancient Switzerland were of Celtic origin. They were called *Helvetii* by the Romans; and the country was subsequently called *Helvetia*. The present name of the country is derived from the Canton of *Schweitz*, which was the most distinguished in the revolution of 1307. The Helvetii were subjugated by Julius Cæsar in the year 60 B.C.; and they so continued till the dissolution of the Roman empire, when the Burgundians and the Germans became masters of the country.

During the middle ages, Switzerland, like most parts of Europe, consisted of a number of small, but independent states, which only nominally acknowledged a superior. From an early period the Counts of Hapsburg, who originally possessed a small territory in the Canton of Berne, began to acquire power and influence in Switzerland; and when Rodolph, the head of the house, was elected Emperor of Germany, in 1273, the greater part of the country owed him allegiance. The encroachments of his son Albert, and the tyranny of Gesler, the Austrian governor, drove the people into rebellion. The mountain Cantons of Schweitz, Uri, and Underwalden, led on by the celebrated William Tell, were the first to take up arms against the Austrians; and having totally defeated them in the famous battle of Morgarten, they formed a permanent alliance, which was the foundation of the

Helvetic Confederation, or the Republic of Switzerland. Lucerne, Zurich, Glarus, Zug, and Berne joined the Confederation between 1332 and 1353; Aargau was taken from Austria in 1415; St. Gall, Thurgau, Friburg, Soleure were admitted between 1451 and 1481; the Grisons in 1497; Basle and Schaffhausen in 1501; and Appenzell in 1513. Shortly after Tessin was taken from the Milanese, and Vaud from Savoy.

In 1798 Switzerland was overrun by the armies of France, to which it was subjected under the name of the Helvetic Republic; but after the fall of Napoleon it regained its independence; and its ancient form of government was re-established under the sanction of the Congress of Vienna. On this occasion, too, the number of its cantons was increased to 22, by erecting what were formerly subject and allied districts into cantons.

GREECE.

GREECE is bounded on the north by the Turkish provinces of Albania and Thessaly; on the west and south by the Mediterranean; and on the east by the Archipelago.

Its length from north to south is about 200 miles; and its breadth from east to west is about 160. Its AREA, including the islands, is about 16,000 square miles; and its POPULATION is about 1,100,000.

Greece comprises three great divisions, namely, Hellas, or Continental Greece, called also Livadia; the peninsula of the Morea, and Eubœa or Negropont, and the other islands.

In 1833, the whole country was divided into 10 *nomarchies* and 45 *eparchies*. Five of the nomarchies are in the Morea, three in Hellas, and two are made up of the islands.

Nomarchies.	*Chief Towns.*
HELLAS:	
Attica and Bœotia,	Athens, Thebes (Thiva), Livadia.
Phthiotis and Phocis,	Zeitoun, now Lamia, Salona.
Acarnania and Etolia,	Missolonghi, Lepanto.
MOREA:	
Argolis and Corinth,	Nauplia, Hydra, Argos, Corinth.
Achaia and Ellis,	Patras.
Arcadia,	Tripolitza.
Messenia,	Modon, Navarino.
Laconia,	Mistra.
ISLANDS:	
Eubœa or Negropont, &c.	Chalcis or Egripo.
Cyclades,	Hermopolis.

CHIEF TOWNS.—*Athens*, the capital, is a mean town, but interesting from its ancient name and splendour. It still contains many relics of its former magnificence. *Nauplia* (or Napoli di Romania), the late capital, is the best built town in Greece, with a fine harbour and a fortress. *Tripolitza* was the residence of the Turkish Pacha, and the capital of the Morea. The Turks razed it to the ground, but it has been partly rebuilt. *Syra*, on the island of the same name, has an ex-

cellent harbour and a flourishing trade. It is the principal station for steamers to and from Constantinople. *Hydra*, on the island of the same name, is also an important town, with a large trade. The *Hydriot* sailors are noted for their skill and intrepidity. *Patras* is noted for its commercial activity. *Missolonghi* is memorable as the place where Lord Byron died. *Mistra* is near the site of the ancient Sparta.

POPULATION OF THE CHIEF TOWNS.—The following are the largest:—Athens, 32,000; Syra or Hermopolis, 15,000; Hydra, 12,000; Nauplia, 10,000; Patras, 9,000; Chalcis or Egripo, 5,500; Tripolitza, 3,000; Navarino, 2,000.

SEAPORTS.—The principal seaports are Athens (the Piræus), Patras, Nauplia, Syra, Kalamata, and Navarino.

ISLANDS.—The largest island is Negropont or Eubœa. The smaller islands are Kuluri (Salamis), Egina, Hydra, Spezzia, Andro, Tino, Mikoni, Syra, Zea, Thermia, Serfo, Sifanto, Milo, Paros, Antiparos, Naxos or Naxia, Santorin, Delos, &c.

GULFS.—Patras, Lepanto, Egina, Nauplia, &c.

CAPES.—Colonna, Matapan, Maleo or St. Angelo, &c.

MOUNTAINS.—Parnassus and Helicon, in Livadia; Taygetus or the Mountains of Maina, in the Morea. See page 84.

SURFACE AND SOIL.—The *surface* of the country is beautifully diversified with mountains, valleys, and plains. The *soil* is, for the most part, very fertile; and the CLIMATE is, in general, mild, delightful, and healthful, except in the low and marshy tracts round the shores and lakes.

Greece is capable of great agricultural improvement; and its numerous bays and harbours render it admirably adapted for commerce. The Greeks are a lively and ingenious people, but they are accused of being deceitful and treacherous. These vices were naturally engendered by the tyranny and oppression of the Turks. But now that they are no longer slaves, it is to be hoped that they will prove themselves worthy of freedom, and of their ancient name. The heroism displayed by many of them in their struggles for freedom with the Turks was worthy of the best days of Greece.

The monarchy established in Greece is under the protection of England, France, and Russia.

The national religion is the Greek Church, so called from having been established by the Greek emperors, the successors of Constantine the Great.

HISTORICAL SKETCH.

The first inhabitants of Greece were the Pelasgi, Lelĕges, and other barbarous tribes who originally migrated from Asia through Thrace and Thessaly.

In process of time they formed themselves into a number of states, governed by kings or princes called *tyranni*. The continued stream of migration from the East contributed to civilize them. Thus Cecrops at the head of an Egyptian colony, settled in Attica; Danaus, another Egyptian, from whom the Greeks were called *Danai*, in Argos; Cadmus, the Phœnician, who introduced alphabetic writing into

Greece, in Bœotia; and Pelops, a Phrygian prince, in *Peloponnesus*,[a] to which he gave his name.

The most ancient kingdoms of Greece were Sicyon and Argos. The former is said to have been founded by Egialeus, 2089 years before the Christian era; and the latter by Inăchus, in the year 1856 B.C.

CECROPS became king of Attica in the year 1556 B.C. He divided the country into twelve districts, and instituted the celebrated court of justice called the Areopăgus, which we find in existence in the time of St. Paul. AMPHICTYON, the third king of Attica, established the *Amphictyonic* council, which consisted of deputies from the different states of Greece, who met twice a year to consult for the common interest. This council had a great effect in uniting the Greeks, and in inspiring them with a feeling in favour of their common country, of which they gave glorious proofs during the Persian invasions.

THESEUS, a succeeding king of Attica, united the twelve districts of Cecrops into one, making Athens the capital. This was about 1234 years before the Christian era; and about thirty years previous to this, was the famous Argonautic expedition under Jason, Theseus, Hercules, and other Grecian heroes. The account of this expedition is largely blended with fable. It was said to have been in search of a celebrated fleece of gold; but commercial enterprise or predatory warfare seems to have been its real object.

CODRUS, who devoted himself to death for his country, was the last king of Athens (B.C. 1070) After him the regal dignity was abolished, and a chief magistrate elected under the name of Archon or *ruler*. At first, his authority was for life; afterwards for ten, and subsequently for one year. At last, nine Archons were chosen, the chief of whom was called *the Archon*, and the current year was called by his name.

The kingdom of Thebes was founded by CADMUS from Phœnicia, who built that city, and introduced alphabetic writing into Greece (B.C. 1493).

The war against Thebes was the first instance of a league among the Grecian states. The cause of it was a contest between Polynīces and Eteŏcles, the sons of Œdĭpus, for the throne of Thebes. The brothers killed each other, and most of the confederate chiefs were slain, but their sons, the Epigŏni,[b] as they were called, renewed the war ten years after, which terminated in the capture of Thebes. The misfortunes of the family of Œdipus are the subject of several Greek tragedies.

Shortly after this the famous expedition against Troy was undertaken by the princes of Greece under Agamemnon. The siege of Troy, which lasted ten years, rests chiefly on the authority of the poet Homer, who has celebrated the event in his well-known poem the Iliad, so called, because the subject of it is the destruction of *Ilium* or Troy (B.C. 1184).

Before this time the Greeks had begun to send colonies to Asia Minor, Italy, and Sicily. The Æolians founded Smyrna and other cities in *Æolia* to which they gave their name; the Ionians, Ephĕsus, &c., in

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[a] Peloponnesus, that is, the *island* of *Pelops*. Its original name was Apia; and it is now called the Morea.

[b] Epigŏni, that is, *sons* or descendants.

Ionia; and the Dorians, Tarentum and Locri in Italy, and Syracuse and Agrigentum in Sicily.

The states of Greece were united by language, religion, and a feeling in favour of their common country. This union was produced principally by the Amphictyonic council, and the celebration of the various games to which they all resorted, and during which all hostilities were suspended. These were the Olympic, the Isthmian, the Pythian, and the Nemean games. The union of the Grecian states, however, was rather against the invaders of their common country. Amongst themselves there were often bitter jealousies and deadly wars.

SPARTA, or LACEDÆMON, was the first state which obtained an ascendancy over the others. The military superiority of this state was owing to the effects produced by the celebrated laws of Lycurgus, which continued in force for about five hundred years.

In imitation of the Spartans, the inhabitants of ATHENS solicited Draco, a man of high character for wisdom and integrity, to draw up a code of laws for them. The laws of Draco punished all crimes equally with death; and hence they were said to have been written with blood. Their excessive severity soon caused them to be abolished; and SOLON, one of the seven wise men of Greece, was chosen as their legislator. The laws of Solon, which remained in force as long as Athens continued a free state, had a great effect in forming the character of its inhabitants. The Athenians were distinguished from all the other inhabitants of Greece, by their love of literature, and their cultivation of the fine arts, which they brought to the highest state of perfection.

Under Pelopidas and Epaminondas THEBES became the leading and most powerful state of Greece. But as its glory had arisen with those brave and illustrious leaders, so it declined on their death.

After the death of Epaminondas (B.C. 363) MACEDONIA, which had been regarded by the Greeks rather as a barbarous province than as a part of Greece, acquired great power and pre-eminence under Philip, an artful, but able prince, and his celebrated son, Alexander the Great, who, at the age of twenty-five, left his native country with an army of 35,000 men for the conquest of the world.

IONIAN ISLANDS.

THE Ionian Islands, on the west coast of Greece, form a republic under the protection of the British crown.

These islands are Corfu, Paxo, Santa Maura, Ithaca, Cephalonia, Zante, and Cerigo.

CHIEF TOWNS.—Corfu is the capital, but Zante, on the island of the same name, is the largest town of the republic.

The extent of this little republic in square miles is about 1,000; and the population is about 244,000.

The inhabitants are a mixture of Greeks and Italians. They are ingenious and active; and export considerable quantities of wine, oil, oranges, lemons, and dried fruit.

The government resembles that of England, with a commissioner at its head deputed by the crown.

TURKEY IN EUROPE.

Turkey in Europe is bounded on the north by Austria and Russia; on the west by Dalmatia and the Adriatic; on the south by Greece and the Archipelago; and on the east by the Dardanelles, the Sea of Marmora, the Straits of Constantinople, and the Black Sea.

Its length from Constantinople to the Adriatic is nearly 500 miles; and its breadth, from the Danube at Belgrade, to the northern frontier, is about 400 miles. Its AREA in square miles is about 210,000; and its POPULATION is about 15 millions.

Provinces.	*Chief Towns.*
Rumelia (including Thrace and Macedonia),	Constantinople, Adrianople, Philippoli, Salonika, Seres, Gallipoli, Enoa.
Bulgaria,	Sophia, Shumla, Silistria, Widdin.
Bosnia and part of Croatia,	Bosna-Serai, Trawnik, Bihacz.
Herzegovina,	Mostar.
Albania and Epirus,	Scutari, Durazzo, Yanina.
Thessaly,	Larissa, Trikhala, Pharsalia.
Tributary Provinces.	
Moldavia,	Jassy, Galatz.
Wallachia,	Bucharest, Tergovist.
Servia,	Belgrade, Semendria, Nissa.

CHIEF TOWNS.—*Constantinople*, the capital of the Mahommedan world, was founded by Constantine the Great, in the year 330; from which period till it was taken by the Turks in 1453, it was the capital of the Roman empire in the east. It is beautifully situated, and its harbour is one of the finest in the world. It contains many splendid and graceful-looking buildings, which give it a magnificent appearance from without; but its interior falls far short of its exterior beauty. The houses are in general low and badly built, and the streets, with few exceptions, are narrow and dirty. *Adrianople* is the second city in importance and population, and was formerly the capital of the Turkish empire in Europe. It is called after the Emperor *Adrian*. *Sophia* or *Triaditza*, ranks next in importance. It is badly situated, and has a mean appearance. *Belgrade* is strongly fortified, and is famous as the scene of desperate battles and obstinate sieges between the Austrians and Turks. *Bucharest*, the capital of Wallachia, is a flourishing town. *Salonica*, the ancient *Thessalonica*, is the next to Constantinople in commercial importance. *Shumla* is a strongly-fortified and important town. *Varna*, 47 miles east from Shumla, is also a strongly fortified town. It was taken by the Russians in 1828.

ISLANDS.—In the Mediterranean, Candia, the ancient *Crete*; in the Archipelago, Rhodes, Scio, Lesbos or Mytelene, Lemnos, Patmos, &c.; in the Levant, Cyprus.

SEAS AND STRAITS.—The Archipelago, the Sea of Marmora, the Dardanelles, the Straits of Constantinople.

GULFS.—The Gulf of Arta, Volo, Salonica, Cassandra, &c.

MOUNTAINS.—The Hæmus or Balkan, Rhodope, Athos, Olympus, Ossa, Pelion, Pindus. See page 84.

RIVERS.—The Danube, Save, Pruth, Maritza, Strymon, Vardar, Salembria (*Peneus*), &c. See page 97.

SURFACE.—The surface of the country, generally speaking, is mountainous, but diversified with rich and beautiful valleys, and extensive and fertile plains. The CLIMATE is, in general, delightful, but the country is sometimes visited by the plague. The SOIL is very rich, but agriculture, like every other art and science, is despised and neglected by the Turks.

MANUFACTURES.—Manufactures and commerce are in a neglected state, and chiefly in the hands of Greeks, Armenians, and Jews.

The Turks have the character of being haughty, revengeful, and cruel, vices to which their blind and bigoted attachment to their own religion, and their hatred and intolerance of others, naturally lead. They are found, however, to be hospitable in their intercourse with strangers, and fair and honest in their dealings. They are grave in their aspect and deportment, and exceedingly indolent in their habits.

The Turks are almost wholly uneducated. Popular education consists chiefly in being able to read the Koran; and the knowledge of their learned men amounts to little more than to an acquaintance with its dogmas and ordinances. In fact, the Koran may be said to embrace their religion, laws, and literature. The arts and sciences they regard with contempt and aversion, as the attainments of what they call the infidel world; and painting and statuary are entirely prohibited as profane imitations of the works of the Creator.

The government of Turkey is a despotism of the worst kind,[a] but its rigours have been mitigated of late years through the influence of its European connexions. Its power, which once threatened to enslave all Europe, has long been on the decline, and, in fact, is only kept from dissolution by the mutual jealousies of the Great European Powers. Its dominion in Africa may be said to have passed away; and in Europe it has lost Greece, and its power over the provinces of Servia, Moldavia, and Wallachia, is little more than nominal. In Asia, too, its power is greatly circumscribed. But for the armed interference of the Christian Powers of Europe, particularly England, the whole of Syria as well as Egypt, would have been wrested from the Sublime Porte by Mehemet Ali in 1840.

HISTORICAL SKETCH.

The Turks are of Tartar origin. About the year 800, they took possession of a part of Armenia, which was called from that circumstance *Turkomania*. They afterwards extended their conquests over Syria, Asia Minor, Egypt, and Europe. In 1360, they took Adrianople, and in 1453, Constantinople, which put an end to the Roman empire in the East. The conquest of the Crimea and Morea soon followed; and in 1440, they captured Otranto in Italy. Rhodes was taken in 1522 by Soliman the Magnificent, the terror of Europe; and in 1529, Buda. In the same year Vienna was besieged, but it was saved by the advance of Charles V. In 1683 they again attacked Vienna with an army of 200,000 men, but were repulsed with great slaughter by the Poles under Sobieski. See page 252.

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[a] Chateaubriand describes the government of Turkey as a despotism tempered by regicide.

ASIA.

Asia is the largest, the most populous, and in many respects the most interesting of the great divisions of the globe. It was here that the human race was first planted; and here occurred almost all the interesting events recorded in the Bible. Here, too, the great empires of antiquity rose and fell; and from Asia the elements of society, civilization, and learning, were spread over the other divisions of the earth.

Asia is bounded on the north by the Arctic Ocean, on the east by the Pacific Ocean, on the south by the Indian Ocean, and on the west by Europe, the Mediterranean and Red Sea.[a]

Its length, from the western extremity of Asia Minor (Cape Baba) to the eastern coast of Corea, is about 6,000 miles; and its breadth, from Cape Romania to Cape Severo or the North East Cape, is about 5,300 miles.

For its AREA and POPULATION, see page 154; and for its great NATURAL divisions, page 155.

GENERAL DIVISIONS.

SIBERIA.—Siberia, or Asiatic Russia, extends over the entire *north* of Asia. See page 73.

The *south* of Asia, like the south of Europe, consists of three great projections or peninsulas, which comprise Arabia, India within the Ganges, or Hindostan, and India beyond the Ganges, or the Indo-Chinese peninsula, the most southerly portion of which forms the narrow peninsula of Malaya or Malacca.

In the *middle* regions of Asia, to the *west*, are the Turkish dominions, including Asia Minor, Armenia, Syria, and the Holy Land; and to the *south-west*, Arabia, Persia, and Afghanistan. In the *centre*, are Independent and Chinese Tartary; and to the *east*, the vast and populous empire of China.

Near the *eastern* coast is the *insular* empire of Japan, corresponding to the British Islands on the west coast of Europe.

CHINA.—The AREA of China and its dependencies may be estimated at about a *third*, and its POPULATION, at about the *half* of the whole continent of Asia. See page 154.

HINDOSTAN OR BRITISH INDIA.—About *three-fifths* of this vast and important country is subject to the British crown—and with the exception of five small settlements of the French,[b] and one of the Portuguese—the remaining *two-fifths* are under native princes, who are more or less under British influence and control.

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[a] Asia extends from 1° 22′ to 78° N. L.; and 26° E., to 17° W. L.

[b] The portion of Hindostan possessed by the French and Portuguese may be estimated at 2,000 square miles; and the population at about 700,000. See page 289.

Three of these are called *Independent States*, namely, Cashmere, Nepaul, and Bootan; and the others are called *Protected States*.

Chinese India.—Chinese India, or India beyond the Ganges, is divided into Assam, Birmah, and Malacca, on the west; Siam in the middle; and on the east the empire of Annam or Tonquin, which occupies the whole of the eastern part, including Tonquin, Cochin-China, Siampa, and Cambodia on the coast, and Laos in the interior. The British possessions in this part of India, are stated in page 200.

PRINCIPAL COUNTRIES IN ASIA WITH THEIR CAPITALS.

Countries.	*Capitals.*	*Countries.*	*Capitals.*
Turkey in Asia,	Smyrna.	China,	Pekin.
Arabia,	Mecca.	Tibet,	Lassa.
Persia,	Teheran.	Chinese Tartary,	Yarkand.
Afghanistan,	Cabul.	Turkestan,	Bokhara.
Hindostan,	Calcutta.	Siberia,	Tobolsk.
Chinese India,	Ava.	Japan,	Jeddo.

SEAS, GULFS, BAYS, AND STRAITS.

The Levant, or eastern part of the Mediterranean, Red Sea, Strait of Babelmandeb, Persian Gulf, Strait of Ormus, Gulf of Oman, Gulf of Cutch, Gulf of Cambay, Arabian Sea, Gulf of Manaar, Palk's Strait, Bay of Bengal, Gulf of Martaban, Straits of Malacca, Sunda, and Macassar, Gulf of Siam, China Sea, Gulf of Tonquin, Yellow Sea, Sea of Japan, Gulf of Tartary, Strait of Perouse, Sea of Okhotsk, Sea of Kamtschatka, Gulf of Anadir, Behring's Strait, Gulf of Obi, Sea of Kara.

PRINCIPAL ISLANDS, PENINSULAS, AND CAPES.

In the Levant, Cyprus, Rhodes, Kos, Samo, and Mytilene, &c.

In the Indian Ocean, Ceylon, the Andaman, Nicobar, Laccadive, and Maldive Islands.

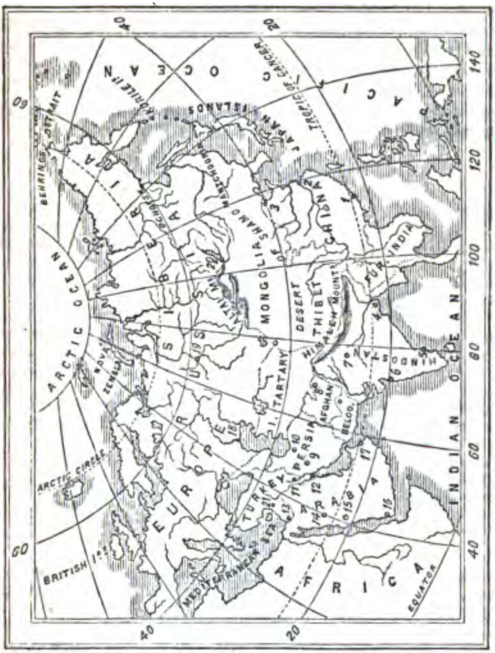
In the Indian Archipelago, Borneo, Sumatra, Java, and Celebes, with the group of the Moluccas or Spice Islands and the Lesser Sunda Islands. Borneo and Java are the Greater Sunda Islands.

In the Pacific Ocean, the Aleutian or Fox Islands, the Kurile Islands, Sagalien, Japan Islands, Formosa, Hainan, and the Philippine Islands.

Peninsulas.—Asia Minor, Arabia, Hindostan, Malacca or Malaya, Cambodia, Corea, and Kamtschatka.

Capes.—In the north of Asia, Cape Severo or North East Cape, East Cape at Behring's Strait, Cape Lopatka, in Kamtschatka; Cape Negrais, in the south of Birmah, Cape Romania, south of the Eastern, and Cape Comorin, south of the Western Peninsula of India, Cape Baba, west of Asia Minor, and Ras-al-Had, in the east of Arabia.

ASIA.



References to the Map of Asia.

Aleppo, . .	21	Canton, . .	1	Medina, . .	14
Astrachan, . .	18	Delhi, . . .	7	Muscat, . .	17
Bagdad, . .	11	Irkutsk, . .	20	Nankin, . .	2
Bassŏra, . .	12	Ispahan, . .	9	Pekin, . .	3
Bombay, . .	6	Jerusalem, . .	13	Sana, . . .	16
Cabul, . .	8	Madras, . .	5	Teheran, . .	10
Calcutta, . .	4	Mecca, . .	15	Tobolsk, . .	19

MOUNTAINS, RIVERS, LAKES.

MOUNTAINS.—The principal mountains are, the Himalayas, the Altaï, the Caucasus, the East and West Ghauts; the Taurus, the Lebanon, and the Ural ranges. See page 71.

RIVERS.—The Yang-tse-kiang, the Hoang-ho, the Lena, the Yenessei, the Obi, the Amour or Saghalien, the Ganges, the Brahmapootra, the Irrawadi, the Indus, the Amoo or Jihon, the Syr or Euphrates, the Tigris, the Sihon, May-kuang or Mekon, &c.

LAKES.—The Caspian Sea, the Sea of Aral, the Dead Sea, and Lake Baikal. See page 98.

TURKEY IN ASIA.

Area about 500,000 square miles. Population about 16,000,000.

DIVISIONS.—1. Asia Minor, including the pashalics or governments of Anatolia, Rhoum, Trebizond, Karamania, Adana, Marash, and the island of Cyprus. 2. Syria, including the pashalics of Aleppo, Tripoli, Acre, and Damascus. 3: Algezira[a] or Mesopotamia. 4. Irak Arăbi. 5. Turkish[b] Armenia and Kourdistan (part of).

PRINCIPAL TOWNS.—1. Smyrna, Scutari, Sinopé, Trebizond, Brusa or Broussa, Kutayah, Angora, Amasia, Sivas, Kaisaryeh (*Cæsarea*), Koniyeh, Adana, Tarsus, and Nicosia (in Cyprus). 2. Damascus, Aleppo, Scanderoon (the port of Aleppo), Antioch, Latakia (*Laodicea*), Tripoli, Tyre, Sidon, Beirout, Acre, Nablous[c], Jaffa, Gaza, Jerusalem, Hems (*Emessa*), and Hamath. 3. Diarbekir, Orfah (*Edessa*), and Mosoul (*Nineveh*). 4. Bagdad, Bassora or Basra and Hillah (*Babylon*). 5. Erzeroom, Kars, Van, Bitlis, Arbil or Erbil (*Arbēla*).

MOUNTAINS.—Taurus, Lebanon, Ararat, &c. See page 74.

RIVERS.—Euphrates, Tigris, Orontes, Jordan, &c. See page 97.

LAKES.—Sea of Galilee, Dead Sea, Van, &c. See page 100.

ARABIA.

Area about 1,000,000 square miles. Population about 12,000,000.

DIVISIONS.—1. Sinai-Region.[d] 2. Hedjaz. 3. Nedjed. 4. Yemen. 5. Hadramaut. 6. Oman. 7. Lachsa or El Hassa.

PRINCIPAL TOWNS.—1. Akaba, Tor. 2. Mecca Jidda (the port of Mecca), Medina. 3. Derayeh. 4. Sana, Mocha, Aden. 5. Makallah. 6. Muscat, Rostak, Sohar. 7. Lachsa.

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[a] From the Arabic *al*, the, and *jezireh*, an island. *Algiers* is another form of the same word.

[b] Part of Armenia now belongs to Russia. Erivan is the capital.

[c] The *Neapolis* of the Greeks, and the Shechem of Scripture.

[d] The Sinai-Region is in the dominions of the Pasha of Egypt; the region of El Hedjaz is nominally subject to the Sultan of Turkey. and the other parts of Arabia are under native princes or chiefs, called Imaums, Sheiks, or Emirs. The Imaum of Yemen is the most powerful.

Islands.—Perim, a small island in the Straits of Babelmandeb, belongs to England; and the Bahrein Islands in the Persian Gulf.

Mountains.—Sinai, Horeb, &c. See page 74.

Gulfs.—Suez, Akaba, Oman, and Aden. (See *Aden*, p. 200).

Rivers.—See note on Guadalquiver, page 98.

PERSIA.

Area about 500,000 square miles. Population about 10,000,000.

Divisions—1. Irak Ajemi. 2. Khorassan. 3. Astrabad. 4. Mazanderan. 5. Ghilan. 6. Azerbijan. 7. Kourdistan (part of). 8. Luristan. 9. Khuzistan. 10. Fars or Faristan 11. Laristan. 12. Kerman.

Principal Towns.—1. Teheran, Ispahan, Hamadan. 2. Mushed, Yezd. 3. Astrabad. 4. Saree, Balrush. 5. Resht. 6. Tabriz or Tauris. 7. Kermanshah. 8. Khorramabad. 9. Shuster. 10. Shiraz, Bushire. 11. Lar. 12. Kerman,

Islands.—Ormus, Kishma, and Karak, in the Persian Gulf.

Mountains.—Elburz, &c. See page 73.

Rivers.—Aras or Araxes, Kizel-Ozen, Kerah, Karoon.

AFGHANISTAN.[a]

Area about 225,000 square miles. Population about 5,120,000.

Divisions.—1. Herat.[b] 2. Cabool. 3. Candahar. 4. Seistan.

Principal Towns.—1. Herat. 2. Cabool, Jelalabad, Ghuznee. 3. Candahar. 4. Dooshak.

Mountains.—The Solimaun Mountains on the east, the Hindoo-Koosh on the north-east, the Kyber Mountains, &c. See page 73.

Rivers.—The Cabool, the only large tributary of the Indus from the west; and the Helmund, which flows into the salt lake of Zurrah, in Seistan. This lake has no outlet. See page 99.

Government.—The Afghans are divided into several tribes, each under its own khan or chief. Sometimes the various tribes are united under one shah or sovereign; but such unions are seldom of long continuance. The Afghans are a fierce and fanatical people. They are Mahommedans.

BELOOCHISTAN.

Area about 160,000 square miles. Population about 1,000,000.

Divisions.—It is divided into six provinces, namely, Kelat,

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[a] The termination *stan* is from a Persian word which means country or *land*. Hence Afghani*stan* the land of the Afghans; Beloochi*stan*, of the Beloochees; Turke*stan*, of the Turks; Hindo*stan*, of the Hindoos, &c.

[b] *Herat* is an ancient (*Areia*) and strongly fortified city. It has been called "the Gate of India." Cabool, Jelalabad, and Peshawur are important in the same point of view. *Cabool* is on a table-land 6,400 feet above the level of the sea. It was the scene of the Afghan treachery and murders in 1841; which, and also the massacre of the British troops and camp followers in the *Kyber Pass*, were in the spring of the following year, fully avenged. *Jelalabad* is noted for the heroic defence made by Sir R. Sale, and its small garrison during the winter of 1841 against the whole power of the Afghans.

Sarawan, Cutch, Gundava, Jhalawan, Lus, and Mekran. The chief towns are Kelat and Gundava.

GOVERNMENT.—Beloochistan is at present politically independent of Afghanistan. The Khan of Kelat is the nominal sovereign; but the real government is with the chiefs of the various tribes. The Beloochees are of the same religion, and of the same character as the Afghans, but less civilized.

HINDOSTAN.

This vast peninsula extends from the Himalaya Mountains on the north, to Cape Comorin on the south; and from the Indus on the west, to the head of the Bay of Bengal on the east. Its AREA is estimated at upwards of 1,400,000 square miles; and its POPULATION at about 180 millions.

DIVISIONS.—1. British India. 2. Protected States. 3. Independent States. 4. Possessions of Foreign Powers, not British.

BRITISH INDIA.—British India, which comprises about three-fifths of the whole country, is divided into the three Presidencies of Bengal, Madras, and Bombay. Of these BENGAL is the most extensive, and the most important. It comprises almost the whole of the north of India, from the head of the Bay of Bengal on the east, to Afghanistan on the west;[a] and also the provinces of Nagpore, in Central India, and of Cuttack, on the eastern coast. The British possessions in India beyond the Ganges are also under the jurisdiction of this Presidency. See page 200.

The MADRAS Presidency extends entirely across the southern part of the peninsula; and the Presidency of BOMBAY, which is the smallest of the three, lies wholly on the western side of India.

BENGAL PRESIDENCY.[b]

PROVINCES.—The principal provinces and districts of the Bengal Presidency are—1. Bengal Proper. 2. Bahar. 3. Benares. 4. Alla-

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[a] This vast extent of country comprises the valley of the lower part of the Brahmapootra, and almost the whole of the valleys of the Ganges, the Jumna, the Upper Indus, and their numerous tributaries. In fact, the Presidency of Bengal alone is more than twice as large as the United Kingdom of Great Britain and Ireland.

[b] The Presidency of Bengal is subdivided into three governments or districts:—1. *Territories under the administration of the Governor-General in Council*, namely, the Punjaub (comprising the provinces of Lahore, Jelum, Mooltan, Leia, Peshawur, and Jullundur), the Cis-Sutlej States, Oude, and Nagpore; and also Pegu, the Tenasserim provinces, and the Eastern Straits' Settlements. 2. *Territories under the administration of the Lieutenant-Governor of Bengal*, namely, Patna, Bhagulpore, Moorshedabad, Dacca, Jessore, Sunderbunds, Chittagong, and Cuttack, and the non-regulation provinces of Assam and Aracan. 3. *Territories under the administration of the Lieutenant-Governor of the North-west Provinces*, namely, Delhi, Meerut, Rohil-

habad. 5. Oude. 6. Agra. 7. Rohilcund. 8. Delhi. 9. Kumaon. 10. The Punjaub. 11. Ajmeer. 12. Nagpore. 13. Cuttack

PRINCIPAL TOWNS.—1. Calcutta, Dacca, Moorshedabad, Serampore, Plassey. 2. Bahar, Patna, Gayah. 3. Benares, Mirzapore. 4. Allahabad, Cawnpore. 5. Lucknow, Fyzabad. 6. Agra. 7. Bareilly. 8. Delhi, Meerut, Hurdwar. 9. Almora. 10. Lahore, Amritsir. 11. Ajmeer. 12. Nagpore. 13. Cuttack, Pooree (or Juggernaut).

MADRAS PRESIDENCY.

PROVINCES.—The principal provinces and districts of the Madras Presidency are—1. The Carnatic. 2. The Circars. 3. Coimbatore. 4. Malabar. 5. Canara.

PRINCIPAL TOWNS.—1. Madras, Arcot, Tranquebar, Tanjore, Trichinopoly, Madura, Tinnevelly, Palamcottah. 2. Masulipatam, Coringa. 3. Coimbatore, Ootakamund. 4. Calicut, Cananore. 5. Mangalore.

BOMBAY PRESIDENCY.

PROVINCES.—The principal provinces and districts of the Bombay Presidency are—1. The N. and S. Concan. 2. Poonah. 3. Sattara, Beejapore. 4. Candeish (part of). 5. Guzerat (part of). 6. Sinde.

PRINCIPAL TOWNS.—1. Bombay, Surat. 2. Poonah. 3. Satara. 4. Malligawm. 5. Baroche, Ahmedabad. 6. Hyderabad, Shikarpore, Kurachee, Meanee.

CHIEF TOWNS.—*Calcutta*, on the Hoogly, a branch of the Ganges, about 100 miles from the sea, is the capital of British India, and the residence of the Governor-General. In the European portion of the city the streets are wide and splendid; and some of the buildings, as the Government House, are magnificent; but in the native quarter, or "Black Town," the streets are narrow and dirty, and the houses, generally speaking, low and mean, with here and there a showy pagoda. In fact, the description given of Constantinople applies generally to Calcutta and to all Eastern cities. See page 279. Calcutta is the chief emporium of the trade of India, both inland and foreign. *Madras*, the capital of the Presidency, is on the Coromandel coast. Though it has no harbour, its commerce is extensive. Passengers and goods of every kind are landed through the surf, on a kind of raft called *catamarans*, which the natives manage with great skill and dexterity. *Bombay*, the capital of the Presidency, has, on the contrary, a most excellent harbour, and from this circumstance it derives its name.[a] It is situated on an island of the same name, which is connected with the coast by a causeway. Its commerce is very extensive; and it is the principal packet station. Bombay was part of the wedding portion given to Charles II. with Catherine the Infanta of Portugal.

Delhi, on the Jumna, formerly the capital of the Great Mogul, is a most important and strongly fortified city. It was seized by the Sepoys at the outbreak of their bloody insurrection in May, 1857, and held to September of the same year, when it was taken by storm by

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cund, Agra, Allahabad, and Benares; and also the non-regulation provinces of Kumaon, Ajmere, Nerbudda, &c. The Lieutenant-Governors are appointed by the Governor-General.

[a] *Bombay*, that is, *good bay*—from the Portuguese *bom*, good—the root of which is the Latin *bonus*—and *bahia*, a harbour or bay.

our troops. *Lucknow*, on the Goomtee, a tributary of the Ganges, is the capital of the kingdom of Oude. It is noted for the gallant defence made by its small garrison under Sir Henry Lawrence and his successor, till relieved by the heroic Havelock. *Lahore*, on the Ravee,[a] is the chief city of the Punjab, and the capital of the Sikhs till their final defeat by the British in 1849. *Seringapatam*, formerly the capital of Mysore. See note *, p. 289. *Benares*, on the Ganges, is one of the most sacred cities of the Hindoos, and the chief seat of Brahminical learning. It is visited annually by thousands of pilgrims. *Allahabad*, at the confluence of the Jumna and Ganges, is another of their sacred cities.

Cawnpore, higher up on the Ganges, is a military station, and was the scene of the most shocking cruelties perpetrated during the Sepoy rebellion. The author and instigator of these worse than murders, was the fiend Nana Sahib. *Patna*, on the Ganges, below Benares, is one of the largest cities of India, and a place of great trade. *Moorshedabad* was the Mohammedan capital of Bengal. *Dacca*, on an arm of the Brahmapootra, was formerly noted for the manufacture of the finest muslins in the world. *Agra*, on the Jumna, is a large and important town. In the vicinity of it is the *Taj-Mahal* (the crown of edifices), the most superb and the most beautiful mausoleum in the world. It was erected by Shah Jehan in 1640 in honour of his wife. *Poonah*, 80 miles south-east of Bombay, is an important military station. *Surat*, on the Taptee, has a Hindoo hospital for sick, maimed, and aged animals. *Peshawur*, an important town commanding the entrance to the Kyber Pass. *Hurdwar*, on the Ganges, near its issue from the Himalayas, is noted for its great fair; and, being a sacred city, for its annual concourse of pilgrims. *Simla*, near the Sutlej, is noted for the coolness and salubrity of its climate, and is much resorted to by European invalids. It is the frequent residence of the Governor-Generals of India. It is 7,800 feet above the level of the sea. *Amritsir* is the holy city of the Sikhs, and a place of great trade. *Cashmere* or Serinugger, on the Jelum, is famous for its shawls, which are made of the inner wool of the Thibet goat.

There are many other large and important cities in Hindostan; as Hyderabad, Ahmedabad, Oojein, Baroda, Nagpoor, Furruckabad, Mirzapore, Bareilly, Arcot, Masulipatam, Tanjore, Serampore, Bangalore, Aurungabad, Cuttack, Mangalore, Cochin, &c.

POPULATION OF THE CHIEF TOWNS.—The population of Calcutta is upwards of 600,000;[b] of Madras, about 500,000; of Bombay, upwards of 300,000; of Lucknow, about 300,000; of Benares, at least 300,000; of Patna, nearly 300,000; of Delhi, about 200,000; of Lahore, 120,000; and of most of the other principal towns mentioned, the population is from about 100,000 to 20,000.

MOUNTAINS.—In the north, the Himalayas; in the centre, the Vindhya Mountains; in the south, the Eastern and Western Ghauts, and the Neilgherry Hills. See pages 71 and 119.

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[a] *Ravee.*—One of the *five rivers* which give name to the *Punjab*. The others are the Indus, the Jelum, the Chenab, and the Sutlej.

[b] Of the entire population of Calcutta, only about 8,000 are Europeans; and of the population of the other towns mentioned, the proportion of the European inhabitants is much less.

RIVERS.—The Indus, the Ganges (and their numerous tributaries), the Brahmapootra, the Nerbudda, the Tapty, the Mahanuddy, the Godavery, the Kistna, &c. See page 97.

PROTECTED STATES.

The native states of India which are tributary to, and under the protection of Great Britain, are called the Protected States. They are usually governed by chiefs under the title of Rajah.[a] The following are the principal:—

STATES.—1. Hyderabad. 2. Mysore. 3. Cochin. 4. Travancore. 5. Kolapore. 6. Sawunt-Warree. 7. Indore.[b] 8. Gwalior.[b] 9. Bhopaul. 10. Guzerat. 11. Cutch. 12. Rajpootana. 13. Bahawalpore. 14. Hill States.[c] 15. Sikhim.

PRINCIPAL TOWNS.—1. Hyderabad, Aurungabad, Assaye.[d] 2. Mysore, Seringapatam,[e] Bangalore. 3. Cochin. 4. Trivandrum. 5. Kolapore. 6. Sawunt-Warree. 7. Indore. 8. Gwalior, Oojein. 9. Bhopaul. 10. Baroda, Cambay. 11. Bhooj. 12. Oodeypore, Jhodpore, Bikaneer. 13. Bahawalpore. 14. Kanum, Nahun. 15. Tumlong.

INDEPENDENT STATES.

The Independent States are now reduced to three, namely, Cashmere, Nepaul, and Bootan. Cashmere (Golab Sing's dominions), is in the region of the Himalayas, and comprises the celebrated valley of that name. Its principal towns are Cashmere or Serinuggur, and Islamabad. See page 72. The States of Nepaul and Bootan lie farther to the eastward, and are divided from each other by the small State of Sikhim. Khatmandoo and Ghoorka are the principal towns of Nepaul; and Tassisudon and Punakha, of Bootan.

FOREIGN POSSESSIONS, NOT BRITISH.

To the French belong Pondicherry and Karical on the Coromandel Coast; Yanaon near the mouth of the Godavery river; Mahé on the Malabar Coast, near Calicut; and Chandernagore on the Hooghly river, north of Calcutta. To the Portuguese belong Goa, a town and small territory on the west coast of India, between the limits of the Madras and Bombay Presidencies; the port of Damaun. to the north of Bombay; and the town and port of Diu, on an island off the south coast of Guzerat. See note [b], page 281.

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[a] The ruler of Hyderabad is called the *Nizam;* and the ruler of Guzerat, the *Guicowar.*

[b] *Indore* (Holkar's possessions). *Gwalior* (Scindia's possessions).

[c] The *Hill States* are in the extreme north of India; in the region of the Himalayas.

[d] *Assaye.*—Near this small town, the Duke of Wellington (then Sir Arthur Wellesley), gained a most splendid victory (in 1803).

[e] *Seringapatam,* the capital of Hyder Ally's dominions, is built on an island in the Cauvery river. Under his son and successor, Tippoo Saib, it was stormed by the British in 1799.

CEYLON.

This large and important island, which is separated from the south of India by the Gulf of Manaar and Palk's Strait, forms a distinct government under the British Crown.

Its AREA is estimated at 24,600 square miles; and its POPULATION at upwards of 2,500,000. The natives are called *Singalese;* and their religion is Buddhism. But though they differ in this, and in some other respects, from the *Hindoo* inhabitants of the mainland, they are supposed to be of the same origin.

The CLIMATE of Ceylon is cooler and more salubrious than that of the adjacent continent, and its SOIL is noted for the luxuriance of its vegetation, and the richness of its productions. From it we obtain our chief supply of cinnamon; and its forests yield timber of the most valuable kind; as teak, rosewood, ebony, and sandal-wood. It is also noted for its pearl fishery, its precious stones, and its ivory.

Colombo, on the west coast, is its capital, and principal seaport. *Kandy*, the ancient capital, is near the centre. *Trincomalee*, on the north-east coast, has a harbour which might be made one of the finest in the world. *Point de Galle*, on the south-east coast, is the principal station for the East Indian steam-packets.

CHINESE INDIA, OR INDIA BEYOND THE GANGES.

India beyond the Ganges forms the south-easterly division of the Asiatic continent. It extends from the Bay of Bengal on the west, to the China Sea on the east; and includes within it what is called the Eastern Peninsula.

DIVISIONS.—1. British Territories. 2. Birman Empire. 3. Siam and part of Cambodia. 4. Malay States. 5. Laos. 6. Empire of Anam or Cochin China, comprising Tonquin, and part of Cambodia.

BRITISH TERRITORIES.—The British territories consist chiefly of provinces which have been acquired by conquest or cession from Birmah or the Birman empire. They are as follows:—1. Assam. 2. Aracan. 3. Pegu. 4. Tenasserim Provinces. 5. Penang or Prince of Wales' Island. 6. Malacca (a small portion of the western coast of the peninsula). 7. The island of Singapore. See page 200.

CHIEF TOWNS.—1. Gowhatty. 2. Aracan, Akyab. 3. Rangoon, Martaban. 4. Moulmein, Tavoy, Mergui. 5. Georgetown. 6. Malacca. 7. Singapore.

BIRMAN EMPIRE.—The area of it is estimated at 200,000 square miles; and the population at about 5,000,000. The principal towns are Ava and Amerapoora.

SIAM, &c.—The area is about 250,000 square miles; and the population is estimated at 6,000,000. The chief towns are Bangkok or Bankok, and Ayuthia or Siam.

MALAY STATES.—The area is about 80,000 square miles; and the population about 1,000,000; but a large portion of the northern part of it belongs to the Kingdom of Siam, and is inhabited chiefly by Siamese. The principal town is Salangore.

LAOS.—Laos consists of several states, some of which are independent, and the rest are tributary to Siam, Cochin China, or China Proper. The area of the whole is estimated at about 130,000 square miles. The principal town is Lanchang.

ANAM OR COCHIN CHINA.—The area is about 500,000 square miles and the population about 13,000,000. The chief towns are Hué, Kachao or Kesho (in Tonquin), and Saigon (in Cambodia).

CHINESE EMPIRE.

The Chinese Empire includes, in addition to China Proper, Tibet, Chinese Tartary, Manchooria, Corea, Mongolia, and Chinese Tartary, or Little Bucharia. The area of China, including its dependencies, is larger than the whole continent of Europe. The area of China alone is about 1,500,000 square miles; and the estimates of its population vary from 200 to 350 millions. See page 281.

DIVISIONS.—China Proper is divided into 18 provinces, many of which are larger than some European kingdoms. Six of these provinces are *maritime*, but even of them little is known by Europeans.

MARITIME PROVINCES.—1. Pee-che-lee. 2. Shan-tung. 3. Kiang-su. 4. Che-kiang. 5. Fo-kien. 6. Quang-tung.

CHIEF TOWNS.—1. Pekin. 2. Tse-nan-foo. 3. Nankin, Shang-hai. 4. Hang-chow-foo, Ning-po. 5. Foo-chow-foo, Amoy. 6. Canton.

Pekin[a] or *Peking* in the north-eastern part of China, near the Peiho, and about 100 miles from its mouth, has been the capital since the country became subject to Tartar rule. It is divided into two distinct cities, the Tartar on the north, and the Chinese on the south. It is said to contain 2,000,000 of inhabitants. *Nankin*[a] or *Nanking*, on the Yang-tse-kiang, was formerly the capital of China. It ranks next to Pekin, and is noted for its extensive manufactures of silk, satin, crape, artificial flowers, china or Indian ink, paper, and the cotton fabric called *nankeen*. Its celebrated porcelain tower or pagoda was destroyed a few years ago. It was 200 feet high, and contained nine stories. The population of Nankin is upwards of 500,000. *Canton*, on the Choo-kiang or Canton river, about 70 miles from its mouth, was, till of late years, the only port at which Europeans were permitted to trade. It is still the great emporium of foreign commerce. For about 40 miles below Canton, the river is called Boca or Bocca Tigris, or "the Bogue;" and the estuary below, "the Outer Waters." The population of Canton,—including the thousands of families that live in boats or floating houses, on the river—is upwards of a million. *King-te-chiang*, east of Lake Poyang, is the chief seat of the manufacture of porcelain in China, for which, it is said, 500 furnaces are employed. The population is supposed to be about a million.

There are several other large and important cities in China; as Shang-hai, Han-yang-foo, Foo-chow-foo, Hang-chow-foo, Ning-po, Amoy, Tai-wan (the capital of Formosa), &c.

ISLANDS.—Hainan, Formosa, Chusan, Loo-Choo Islands, Macao (mak-ou), belonging to the Portuguese, and Hong-Kong belonging to the British. The capital of Hong-Kong is *Victoria*.

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[a] *Pekin* means the northern, and *Nankin* the southern court.

GULFS, &c.—The Gulf of Pechelee, the Bay of Tah-lien-hwan, (in the Gulf of Pechelee, near Regent's Sword), the Yellow Sea, &c.

MOUNTAINS.—The Thian-Shan, the Kuen-lun, &c. See page 73.

RIVERS.—The Yang-tse-Kiang, the Hoang-ho, &c. See page 97.

LAKES.—Tung-ting-hou, Poyang-hou, Tai-hou, Hong-tse-hou.

China is the oldest existing empire in the world. Before the Christian era it was a powerful, and a comparatively civilized country; but such as it was then, it continues now. Every thing in it seems to be stereotyped—or it is, as the poet has described it, a "Dead Sea of Man.[a] This want of progress or advancement arises—partly from the obstinate attachment of the Chinese to the customs and habits of their forefathers; and partly, from their no less obstinate isolation of themselves from the rest of the world. The art of printing, the mariner's compass, and gunpowder were known to them long before they were discovered by Europeans; but these arts are with them still in their infancy. They still print from wooden blocks; the mariner's compass does not enable them to circumnavigate the globe; and till recently, they did not use gunpowder in war. And though they have had canals for upwards of 2,000 years, they still use rollers or inclined planes instead of locks, by means of which the boats are drawn up to the higher, or slid down to the lower levels.

The Chinese are however, very ingenious in the light mechanical arts; and in the manufacture of fine porcelain, rich silks, embroidery, artificial flowers, filigree-work, lacquered wares, carving in ivory, &c. they excel Europeans. And as proofs of their industry, on a large scale, it is sufficient to mention the Great Wall,[b] the Imperial Canal, and the Porcelain Tower.

Many of the tastes and habits of the Chinese are very strange; such as the custom among the upper classes, of compressing the feet of their female children so as to prevent their growth. The feet of Chinese ladies, therefore, are not larger than those of little girls; and this is considered not only as a mark of high breeding, but also as a great personal beauty. We would regard such feet as deformed; and as to walking, for which nature intended them, they can be of very little use to the poor ladies. If they make the attempt at all, they must hobble along, like a person on wooden legs. Another custom among the upper classes of both sexes is to let their nails grow frightfully long. This is considered a mark of gentility and of exemption from manual labour. The tastes of the Chinese with regard to articles of food are also peculiar. The higher or wealthier classes import, as luxuries, edible birds' nests from Java and other East India islands; and also large quantities of *tripang* or sea-slugs. And with regard to the lower classes, they are by no means particular as to what they

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[a] "Jealous China, strange Japan,
—You are but dead seas of man!"

[b] The Great Wall was built about 200 years before the Christian era, as a defence against the Tartars, which, however, proved unavailing. It is carried in a north-western direction over all obstructions, as mountains and rivers, for upwards of 1,200 miles. It varies in height from 15 to 30 feet; and it is so thick that six horsemen can ride abreast upon it. The Imperial or Great Canal extends northward from Hong-chow-foo to a branch of the Peiho, a distance of about 700 miles.

eat. They devour dogs, cats, rats, mice, and almost every animal, no matter in what manner it has met its death. Rice, however, is the general food of all classes.

Among the Chinese, reverence for parents is strongly inculcated; and disrespectful language to a father is a capital offence.

The government is despotic, but the emperor professes to rule in a patriarchal spirit. The mandarins[a] affect to do the same; and when offenders are punished, no matter how severely or unjustly, they must thank them for their fatherly care.

The prevalent religion of the Chinese is Buddhism, the head of which is the Grand Lama in Tibet; but other forms of religion, even grosser, are professed by many.

Upwards of 200 years ago (1644), China was conquered by the Manchoo Tartars; and since that period, the emperors have been Tartars. Of late years, however, efforts have been made by the Chinese to expel the Tartar dynasty; and a powerful rebellion has been organized for the purpose. Should this movement succeed, great changes will take place in China, for the promoters of the rebellion profess a great desire for intimate intercourse with Europeans, and even call themselves "Christians." However this may be, it is to be hoped that the result of the recent Anglo-French expedition to China will be to open up the country to modern civilization and enlightenment.

Chinese Geographical Terms.

Pe, north.	Hou or Hoo, lake.	Kin or King, court.
Nan, south.	Yang, ocean.	Taï, island.
Tung, east.	Ching, town.	Tse, son.
See, west.	Foo, first rank.	Sha, sand.
Ho and Kiang, river.	Chow, Choo, second rank.	Mo, desert.
Shan, mountain.	Hien, Heen, third rank.	Hoang, yellow.

TIBET, or THIBET.

Tibet consists of high table-lands, enclosed by lofty mountains. See pages 73 and 90. It contains the sources of nearly all the great rivers of Southern and Western Asia; as the Indus, the Sutlej, the Ganges, the Sanpoo or Bramapootra, the Irrawadi, the Mekon or Cambodia, and the Yang-tse-kiang. It also contains several lakes, the most remarkable of which is Palté. It is a ring of water five miles broad, surrounding a large circular island, in which there is a Tibetan temple. This lake is held sacred. See page 72.

Tibet is divided into Tibet Proper, Ladakh or Middle Tibet, and Little Tibet. *Lassa*, the residence of the Grand Lama, is the capital of Tibet Proper; and *Leh* or Ladakh, of Middle Tibet. Lassa is visited by pilgrims from all parts of Asia where Buddhism is professed. It is also a place of great trade. The Tibetans are, however, chiefly a

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[a] *Mandarin* is not a Chinese word. It was applied to their magistrates by the Portuguese, and is derived from the Latin *mandare*, to command. There are several grades of Mandarins; and they all owe their appointments to their learning, which is tested by competitive examinations. Mere book learning, however, is the great object of their study; and the candidates who can repeat the greatest amount of the works and sayings of the ancient sages are always preferred.

EMPIRE OF JAPAN.

The insular empire of Japan lies to the east of Manchooria and Corea, from which it is separated by the Sea of Japan and the Strait of Corea. It consists of a very large number of islands, of which Niphon, Kiusiu, and Sikokf, are the principal. The large island of Jesso or Yesso, north of Niphon, is a dependency of Japan, and not an integral part of it. Three of the southernmost of the Kurile Islands, and also the southern half of the large island of Saghalien, are dependencies of Japan. See note [b], page 295.

The area of Japan and its dependencies is estimated at upwards of 200,000 square miles; and its population, at about 30,000,000.

The Japanese resemble their neighbours the Chinese in many particulars. Till 1854, the Dutch only were permitted to send two vessels annually to Nangasaki (in Kiusiu); but since that time several other ports have been opened, under certain restrictions, to the commerce of all nations.

There are two emperors of Japan, one spiritual or ecclesiastical, and the other temporal. The prevailing religion is Buddhism.

Jeddo or *Yeddo*, in Niphon, is the capital of Japan, and the residence of the temporal sovereign. It is said to have a population of upwards of 2,000,000. *Miako*, on the same island, about 230 miles south-west of Jeddo, is the residence of the spiritual sovereign. *Matsmai* is the principal town in Jesso.

AFRICA.

Africa is remarkable for its vast deserts of burning sand, the ignorance and barbarism of its inhabitants, and the number and ferocity of its animals. Though some countries of Africa, particularly Egypt and Carthage, were early distinguished for civilization and commerce, yet it is at the present day the least known of all the great divisions of the globe; and it is greatly to be feared that even the noble efforts[a] now making under the sanction of the British parliament to introduce civilization and Christianity into the heart of this great continent, will, like all those that preceded them, be defeated *by the nature of the climate*, if not by the barbarism of the inhabitants.

Africa is bounded on the north by the Mediterranean Sea; on the south by the Southern Ocean; on the west by the Atlantic Ocean; and on the east by the Red Sea and Indian Ocean.[b] Its length from the Cape of Good Hope to the Mediterranean is about 5,000 miles; and its breadth from Cape Verde to Cape Guardafui is about 4,700 miles. For its area and population see page 159

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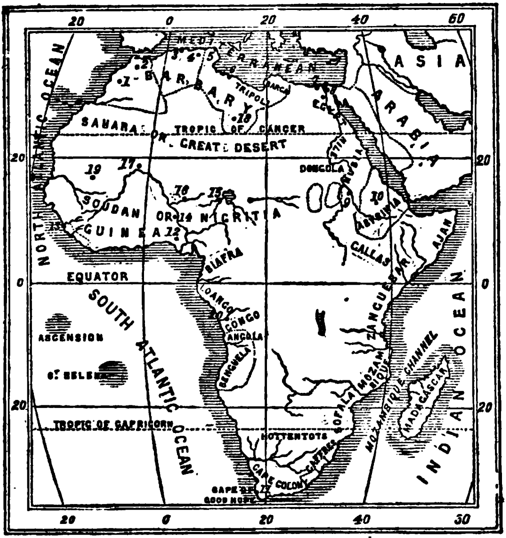
[a] This was written in 1841, and the expedition to which it alludes was, unfortunately, unsuccessful, as here anticipated; but the recent expedition under Dr. Livingstone, will, it is to be hoped, be crowned with success. See page 89.

[b] It extends from 34° 49′ south, to 37° 20′ north latitude, and from 17° 34′ west, to 51° 16′ east longitude.

AFRICA.



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Benin,	12	Fez,	2	Sierra Leone,	13
Benowm,	19	Gondar,	10	Suez,	8
Bornou,	15	Morocco,	1	Timbuctoo,	17
Boussa,	14	Mourzouk,	18	Tripoli,	6
Cairo,	8	Sackatoo,	16	Tunis,	5

GENERAL DIVISIONS OF AFRICA.

1. The BARBARY STATES, which include the whole country north of the desert of the Sahara, and west of the 25th degree of east longitude.

2. The SAHARA, or the Great Desert.

3. The REGION OF THE NILE, including Egypt, Nubia, with Dongola and Sennaar; Abyssinia, Kordofan, and all the country drained by its affluents.

4. Nigritia, which may be subdivided into Soudan or North Nigritia, Central Nigritia, and Southern Nigritia.

Soudan, or North Nigritia, lies between the Kong Mountains and the Sahara; and is watered by the Senegal, Gambia, Niger, and the rivers flowing into Lake Tchad.

Central Nigritia, lies between the Kong Mountains and the northern shore of the Gulf of Guinea to the Bight of Biafra.

Southern Nigritia includes the countries from the Bight of Biafra along the coast to Cape Negro, and inwards to the sources of the rivers flowing through it to the coast.

5. Southern Africa, or the regions south of Cape Negro, on the west, and of Delagoa Bay on the east.

6. Eastern Africa, or the regions north of Delagoa Bay, round by the sea-coast to the confines of Abyssinia.

7. The Islands of Africa are, Madagascar, Bourbon, Mauritius or Isle of France, Rodrigues, the Comoro Isles, Socotra, Amirante, and Seychelles islands on the east coast; and the Madeira, Canary, and Cape Verde Islands, St. Helena, St. Thomas, Annobon, Ascension, Goree, and Fernando Po on the west coast.

SEAS, GULFS, BAYS, AND STRAITS.

Seas.—The principal seas of Africa are, the Mediterranean and the Red Sea; the Gulf of Guinea (including the Bight of Biafra, and the Bight of Benin), the Gulfs of Tunis, Sidra, and Cabes; Delagoa, Algoa, Saldanha, and Table Bays; the Channel of Mozambique; the Straits of Gibraltar and Babelmandeb.

Capes.—The Cape of Good Hope, Capes Agulhas, Corrientes, Delgado, Guardafui, Negro, Lopez, Palmas, Verd, Blanco, Bojador, Nun, Spartel, Bon, and Ras-el-krun.

Mountains.—Mount Atlas, Mountains of Abyssinia, Kong Mountains, &c. See page 89.

Rivers.—The principal rivers are, the Nile, the Niger or Quorra, the Senegal, the Gambia, the Zaire or Congo, the Coanza, the Orange River or Gareep, and the Zambese.

Lakes.—The principal lakes are, Tchad, Debo or Dibbie, Dembea, Marava or Nyassa, Ngami, Taganyika, and Nyanza.

NORTHERN AFRICA, OR THE BARBARY STATES.

Countries.—1. The empire of Morocco, comprising the kingdom of Fez, and the territories of Sus, Draha, Tafilet, Beled-ul-Jerid (*Country of Dates*), &c. 2. Algeria (formerly under the Dey of Algiers, but now a colony of France). 3. Tunis (formerly a beylik or regency of the Ottoman empire, but now under a hereditary and independent Bey, who, however, pays tribute to the Sultan, and acknowledges his sovereignty). 4. Tripoli, comprising Barca, and Fezzan (south of Tripoli). It is under a Pasha, who is subject to the Sultan in the same way as the Bey of Tunis. See *Tripoli*, page 329.

Towns.—1. Morocco, Fez, Mequinez, Mogadore, Rabat, Sallee,

Tetuan, Tangier, Ceuta (opposite to Gibraltar, and belonging to Spain). 2. Algiers, Constantine, Oran, Bona. 3. Tunis, Kairwan, Susa, Cabes. 4. Tripoli, Mesurata, Derna, Mourzouk.

THE NILE REGION.

Egypt, which comprises—1. Lower Egypt. 2. Middle Egypt. 3. Upper Egypt. Towns.—1. Cairo, Alexandria, Rosetta, Damietta, Suez. 2. Ghizeh, Ruins of Memphis, Medinet-el-Fayoum. 3. Siout, Ruins of Thebes, Kenneth or Ghenneth, Assouan (*Syene*).

Egypt is under a hereditary and independent Pasha, who, however, acknowledges the sovereignty of the Sultan. His rule extends over Nubia, Kordofan, part of Abyssinia, and the Sinai region, in Arabia. See page 280.

Nubia lies between Egypt and Abyssinia. It is divided into Lower and Upper Nubia. Towns.—Khartoom, New Dongola, Senaar, Shendy, Souakin, Ebsambool.

Kordofan lies to the west of Upper Nubia. Its principal town is El Obeid.

Abyssinia.—The former kingdom of Abyssinia has been broken up into several distinct states, the principal of which are the kingdoms of Shoa, Amhara, and Tigré. *Ankobar*, in Shoa, is the most important town in Abyssinia. *Gondar*, in Amhara, near Lake Dembea, was formerly the capital of the whole country. *Antalo* is the capital of Tigré, but *Adowa* is a larger and more important town. *Axum*, the ancient capital of Abyssinia, contains several records of the early Christianity of the country. It is now almost in ruins. *Masuah* or *Massowah*, on the Red Sea, is the principal, and almost the only port in Abyssinia.

Christianity was introduced into Abyssinia so early as the year 333; and it still exists in many parts of it, but in corrupted forms.

The Gallas, a barbarous and warlike race of people, frequently overrun the southern parts of Abyssinia, and are now in possession of large portions of it. The Abyssinians themselves are in many respects semi-barbarous. See page 89.

WESTERN AFRICA.

Senegambia.—Senegambia strictly means the region between the rivers *Senegal* and *Gambia*, but it extends southward to the confines of Upper Guinea. *Bathurst*, on the island of St. Mary, at the mouth of the Gambia, is the capital of the British portion of Senegambia. *Bissao* is a Portuguese settlement in it; and for the French settlements, see page 270. The chief native tribes are the Jaloofs or Yalofs, the Foulahs, and the Mandingoes.

Upper Guinea, which comprises—1. Sierra Leone. 2. Liberia. 3. Ashantee. 4. Gold Coast.[a] 5. Dahomey. 6. Benin. Towns.—1. Freetown. 2. Monrovia. 3. Coomassie. 4. Cape Coast Castle, El Mina (See page 264). 5. Abomey. 6. Benin, Waree, Badagry, Lagos, Bonny, Eboe.

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[a] The terms Grain Coast, Ivory Coast, and Slave Coast, which were applied by the old navigators to portions of the Coast of Guinea have now no geographical signification. The *Grain* Coast did not mean *cereal* produce, but *grains*, as of pepper, &c.

Sierra Leone was established in 1787 by some English philanthropists, as a home for negroes who had been emancipated, or who had been re-captured from slave-vessels. It has been a British colony for some time; and the climate is so fatal to Europeans, that it is called "the White Man's Grave."

Liberia was established in 1821 by the United States for the same purpose as Sierra Leone. The form of government is republican.

LOWER GUINEA, which comprises—1. Biafra. 2. Loango. 3. Congo. 4. Angola. 5. Benguela. TOWNS.—2. Loango. 3. St. Salvador. 4. St. Paul de Loanda. 5. Benguela.

SOUTHERN AFRICA.

COUNTRIES.—1. Cape Colony. 2. Natal. 3. Kaffraria, a part of which was annexed in 1847 to Cape Colony, under the name of *British Kaffraria.*[a] 4. Land of the Hottentot tribes, the most degraded of which are the Boshmans or Bosjesmans.

TOWNS.—1. Cape Town, Graham's Town, Port Elizabeth, George Town, Constantia. 2. Pietermaritzburg, D'Urban or Port Natal.

EASTERN AFRICA.

COUNTRIES.—1. Sofala. 2. Mozambique. 3. Zanguebar. 4. Ajan. 5. Adel or Somauli.

TOWNS.—1. Sena, Sofala. 2. Mozambique, Quillimane. 3. Quiloa, Zanzibar, Mombaz. 4. Magadoro, Brava. 5. Zeyla, Berbera.

Of Eastern Africa very little is known. It consists of the countries along the coast from Delagoa Bay to the Straits of Babelmandeb. The Imaum of Muscat claims the sovereignty of that portion of it which lies between the Straits of Babelmandeb and Cape Delgado; and the rest belongs to Portugal. *Sena*, on the Zambesi, is the capital of the Portuguese possessions. *Sofala*, south of the Zambezi, is supposed to be the *Ophir* of the Scriptures.

CENTRAL AFRICA, OR NIGRITIA.

COUNTRIES.—1. Ludamar. 2. Bambarra. 3. Timbuctoo. 4. Houssa. 5. Borgoo. 6. Yarribi. 7. Nyffé. 8. Yaoori. 9. Bornou. 10. Mandara. 11. Begharmi. 12. Darsaley. 13. Darfur.

TOWNS.—1. Benown. 2. Sego. 3. Timbuctoo. 4. Sackatoo, Kano. 5. Kiama, Boussa. 6. Abbeokouti. 7. Rabba. 8. Yaoori. 9. Kouka, Angornou. 10. Mora. 11. Mesna. 12. Warra. 13. Cobbé.

Of these countries very little is known. *Bornou*, south-west of Lake Tchad, is the most powerful of them. Its population is supposed to amount to 5 millions. At Kouka, its capital, Denham and Clapperton saw several thousand cavalry wearing coats of mail, or iron chain armour. The kingdoms or countries next in importance are *Bambarri* and *Timbuctoo*, west of the Upper Niger; *Borgoo* and *Yarribi*, west of the Lower Niger; *Houssa* and *Yaoori*, on the east of the Lower Niger, Houssa is the chief seat of the warlike Fellatahs.[b]

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[a] *British Kaffraria* lies between the Keiskamma and the Great Fish rivers. The chief place in it is *King William's Town*.

[b] The *Fellatahs* or *Foulahs* are a mixed race—partly of Negro, and partly of Moorish or Numidian descent.

AMERICA.

America or the New World, was discovered in the year 1492 by Christopher Columbus, a native of Genoa. It is distinguished from all the other great divisions of the globe by the size and grandeur of its mountains, lakes, and rivers.

America is bounded on the north by the Arctic Ocean, on the south by the Antarctic Ocean; on the east by the Atlantic; and on the west by the Pacific Ocean. It is divided by the Gulf of Mexico and the Caribbean Sea into two vast peninsulas—one of which is called North, and the other South America. North and South America are united by the Isthmus of Darien or Panama, which in one part is only twenty-eight miles across. The length of the whole continent from north to south is 10,500 miles.[a] The breadth of North America, where broadest, is about 3,500 miles; and of South America about 3,200 miles

For the area and population of America, see page 154.

GENERAL DIVISIONS OF NORTH AMERICA.

The *northern* part of North America, from the great lakes to the Arctic Ocean, is called British America, except a portion of the north-western extremity, which belongs to Russia.

The *middle* regions, from the Atlantic to the Pacific, belong to the United States.

The *southern* parts, and the *Isthmus*, comprise Mexico, Guatemala, Salvador, Honduras, Nicaragua, Costa Rica, and Panama.

THE BRITISH POSSESSIONS.

The area of the British possessions in North America is estimated at 3,625,000 square miles; and the population at about 2,700,000. See following page.

States.	*Chief Towns.*
Labrador or New Britain,	Nain Fort.
Hudson Bay Territory,	York Fort.
Upper Canada,	Toronto, Kingston.
Lower Canada,	Quebec, Montreal.
New Brunswick,	Frederick Town, St. John's.
Nova Scotia and Cape Breton,	Halifax, Sydney.
Newfoundland,	St. John's.
Prince Edward's Island,	Charlotte Town.
British Columbia, &c.,	New Westminster.

[a] From about the 72nd degree of north (Cape Murchison), to about the 54th degree of south latitude (Cape Forward). *Cape Murchison*, at the northern extremity of Boothia Felix, is the North Cape of Europe—or rather, the *Nordkyn*. See page 192.

The extent and population of each of the British North American Colonies will be found in the following table :—[a]

Colonies.	*Area in sq. Miles.*	*Population.*	
Canada West (or Upper),	147,832,	1,350,923	(1857)
Canada East (or Lower),	201,989,	1,220,051	(1857)
New Brunswick,	27,700,	200,000	
Nova Scotia and Cape Breton,	18,746,	300,000	
Prince Edward Island,	2,134,	62,348	
Newfoundland,	57,000,	120,000	
British Columbia, &c.,[b]	230,000,	100,000	

THE UNITED STATES.

The United States extend from the British possessions on the north, to the Gulf of Mexico on the south; and from the Atlantic Ocean on the east, to the Pacific Ocean on the west. They originally consisted of *thirteen* States, but now they amount to upwards of thirty. The AREA of the United States is estimated at 3,400,000 square miles; and the POPULATION at about 27,000,000, of which upwards of 4 millions are slaves.

NEW ENGLAND, OR NORTHERN STATES.

States.	*Chief Towns.*
Maine,	Augusta, Portland.
Massachusetts,*	Boston, Salem.
New Hampshire,*	Concord, Portsmouth.
Vermont,*	Montpelier, Burlington.
Rhode Island,	Providence, Newport.
Connecticut,*	Hartford, Newhaven.
MIDDLE STATES.	
New York,*	New York, Albany.
Pennsylvania,*	Philadelphia, Pittsburg.
†New Jersey,*	Trenton, Newark.
†Delaware,*	Dover, Wilmington.
†Maryland,*	Annapolis, Baltimore.
†District of Colombia,	WASHINGTON.
SOUTHERN STATES.	
†Virginia,*	Richmond, Norfolk.
†North Carolina,*	Raleigh, Newbern.
†South Carolina,*	Charlestown, Columbia,
†Georgia,*	Savannah, Augusta.
†Florida,	Tullahasee, St. Augustine.

[a] The British North American Colonies are six in number, each of which is under the administration of a governor appointed by the Crown. Canada East and West are under one governor. Hudson Bay Territory, now called *Rupert's Land*, and Labrador, are not directly under the Crown. *Red River Settlement* is about to be placed under the Crown. It lies between Lakes Winnipeg and Superior.

[b] Including Vancouver Island, Queen Charlotte Island, and the adjacent isles. *Victoria*, the principal town of Vancouver Island, is at present the seat of government for the Colony of British Columbia.

The * denotes that this was one of the original 13 States.

The † prefixed denotes a slave-holding State.

NORTH-WESTERN STATES.

States.	*Chief Towns.*
Minnesota,	St. Paul.
Wisconsin,	Madison, Milwaukie.
Iowa,	Iowa City, Burlington.
†Missouri,	Jefferson City, St. Louis.
Illinois,	Springfield, Chicago.
Indiana,	Indianopolis.
Michigan,	Lansang, Detroit.
Ohio,	Columbus, Cincinnati.
†Kentucky,	Frankfort, Louisville.

SOUTH-WESTERN STATES.

†Tennessee,	Nashville.
†Alabama,	Montgomery, Mobile.
†Mississippi,	Jackson, Columbus.
†Louisiana,	Baton Rouge, New Orleans.
†Arkansas,	Little Rock.
†Texas,	Austin, Galveston.

Territories not yet organized into States, Oregon, Washington, Nebraska, Decotah, Utah, New Mexico, Kansas, and Arizona.

MEXICO.

Mexico consists of the southern and narrowest portion of the North American continent. Of late years large portions of it have been annexed to the territories of the United States, as Upper California, New Mexico, and Texas; but it is still an extensive country. It extends from the 16th to the 23rd parallel of N. L.; and its area is estimated at upwards of 800,000 square miles.

Mexico at present consists of several States which together form a federal union on the model of the republic of the United States; but the frequent and violent political changes to which it is subject are ruinous to the peace and prosperity of the country. This observation is applicable to most of the republics of Central and South America.

The population of Mexico, which amounts to about 8 millions, is of a very mixed character. About one-sixth are whites of Spanish descent; more than two-fifths are Indians; and the remainder—with the exception of about 20,000 Europeans, and perhaps as many negroes—are of those hybrid races which are found in such countries.

Mexico, in a noble plain, 7,500 feet above the level of the sea, is the capital. It is a beautiful and magnificent city. The population is about 200,000. The inland towns next in importance to Mexico, are La Puebla, Guadalaxara, Guanavuato, Zacatecas, and Durango. And the chief ports are Vera Cruz, Tampico, and Monterey, on the Gulf of Mexico; and Acapulco, San Blas, Mazatlan, and Suaymas (Gulf of California).

YUCATAN (in Central America), which withdrew from the Mexican Confederation in 1841, and successfully resisted the forces sent to coerce it, has again joined it.

The † prefixed denotes a slave-holding State.

GULFS, BAYS, STRAITS, AND SOUNDS.—Gulf of St. Lawrence, Strait of Belleisle, Fundy Bay, Delaware Bay, Chesapeake Bay, Gulf or Channel of Florida, Gulf of Mexico, Gulf of California, Nootka Sound, Queen Charlotte Sound, Cook's Inlet, Hudson Bay, James' Bay, Chesterfield Inlet, Fox Channel, Hudson Strait, Davis Strait, Baffin Bay, Lancaster Sound, Barrow Strait, Melville Sound, M'Clintock Channel, Bellot Strait, Regent's Inlet, Gulf of Boothia, Coronation Gulf, Behring Strait.

ISLANDS.—The West Indies, Bahamas, Bermudas, Long Island and Staten (belonging to New York), Rhode Island (part of the State of), Nantucket (belonging to Massachusetts), Newfoundland, Cape Breton, Prince Edward Island Anticosti, Vancouver Island, Queen Charlotte Island, Prince of Wales Island, Sitka Islands, Aleutian or Fox Islands; also Greenland, Cumberland, Cockburn, Southampton, Melville, Parry, and several other islands in the Arctic Archipelago.

PENINSULAS.—Labrador, Boothia Felix, Nova Scotia, Florida, Yucatan, California, Aliaska or Alashka.

CAPES.—The principal capes are Farewell, Chudleigh, Charles (the most easterly point of N. America), Race, Sable, Cod, Hatteras, Sable or Tancha (Florida), St. Lucas, Mendocino (the most westerly point of the United States), Prince of Wales (Russian territory), Point Barrow, Bathurst, Parry.

MOUNTAINS.—The Rocky Mountains, &c. See page 75.

RIVERS.—The principal rivers are, the Mississippi, with the Missouri, the Ohio, and its other tributaries; the St. Lawrence, Rio Grande del Norte, Rio Colerado, Sacramento, Columbia or Oregon, Fraser, Colville, Mackenzie, Coppermine, Back, Churchill, and Nelson rivers, Saskatchewan, &c. See page 98.

LAKES.—The principal lakes are, Superior, Michigan, Huron, Erie, and Ontario (between British America and the United States); Champlain (between the States of New York and Vermont); Winnipeg, Winnipegoos or Little Winnipeg, Manitoban, Deer Lake, Woolaston, Athabasca, Great Slave Lake and Great Bear Lake (in British America); Great Salt Lake (in Utah, page 79).

CENTRAL AMERICA.

Central America consists of the long and narrow region which connects the continents of North and South America.

Area about 175,000 square miles. Population about 2,250,000.

POLITICAL DIVISIONS —1. Tabasco (a Mexican State). 2. Yucatan. 3. Guatemala. 4. San Salvador. 5. Nicaragua. 6. Costa Rica. 7. Panama.[a] 8. Mosquito Coast. 9. Honduras. 10. British Honduras.

PRINCIPAL TOWNS.—1. Villa Hermosa. 2. Merida, Campeachy. 3. New Guatemala, St. Thomas (near the Gulf of Honduras, a Belgian colony). 4. St. Salvador. 5. Leon, Granada, San Juan de Nicaragua or Greytown. 6. San José. 7. Panama, Chagres, Porto Bello. 8. Bluefields. 9. Comayagua, Truxillo. 10. Balize.

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[a] *Panama* was formerly included in the State of New Granada, but since 1855 it has been a separate and independent republic.

ISLANDS.—Ruatan, Utila, Bonacca, and three or four smaller islands in the Bay or Gulf of Honduras. They belong to Great Britain, and are usually called "The Bay Islands."

GULFS, BAYS, &c.—Campeachy Bay, Channel of Yucatan, Gulf of Honduras, Mosquito Gulf, Gulf of Darien, and Bay of Panama.

CAPES.—Cape Catoché, Cape Gracios à Dios.

RIVER.—San Juan, from Lake Nicaragua. See page 100.

SOUTH AMERICA.

South America comprises the republics of Venezuela, New Granada, Ecuador or Equator, Peru, Bolivia, Chili, La Plata, and Paraguay, which formerly belonged to Spain; Guiana, in which the British, Dutch, and French have settlements; the vast Portuguese empire of Brazil; the republic of Uruguay or Banda Oriental; and Patagonia, which is a desolate and almost unknown region.

The area of South America is estimated at about 6,500,000 square miles, and the POPULATION, at about 20,000,000. See page 154.

Countries.	*Principal Towns.*
Venezuela, ...	Caraccas, La Guayra, Cumana.
Granada, ...	Santa Fe de Bogotá, Cartagena.
Ecuador or Equator, . .	Quito, Guayaquil.
Peru, ...	Lima, Callao, Truxillo, Riobamba.
Bolivia or Upper Peru, .	Chuquisaca, Potosi, La Paz.
Chili, ...	Santiago or St. Jago, Valparaiso.
La Plata, ...	Parana, Cordova, Mendoza.
Buenos Ayres,[a] . . .	Buenos Ayres, Carmen or Patagones.
Paraguay, ...	Assumption, New Coimbra.
British Guiana, or Demerara,	Georgetown, New Amsterdam.
Surinam or Dutch Guiana, .	Paramaribo.
French Guiana, . . .	Cayenne.
Brazil, ...	Rio Janeiro, St. Salvador.
Uruguay or Banda Oriental,	Monte Video.
Patagonia, ...	Port St. Julian.

ISLANDS.—The principal islands of South America are, the Falkland Islands, Terra del Fuego, South Georgia, Sandwich Land, New South Shetland Islands, Juan Fernandez, Galapagos, &c.

CAPES.—Cape St. Roque, Cape Horn, Cape Blanco, Cape Vela, &c.

SEAS, GULFS, &c.—The principal seas, gulfs, bays, and straits are, the Caribbean Sea, the Gulfs of Darien, Maracaybo, Guayaquil, All Saint's Bay, the Straits of Magellan, and Straits of Le Maire.

MOUNTAINS.—The Andes or Cordilleras, &c. See page 75.

RIVERS.—The Amazon, the La Plata, the Orinoco, the Magdalena, the Madeira, the Francisco, &c. See page 97.

LAKES.—Titicaca in Bolivia, and Maracaybo in Colombia—which is connected by a narrow channel with the sea. See page 100, and 75.

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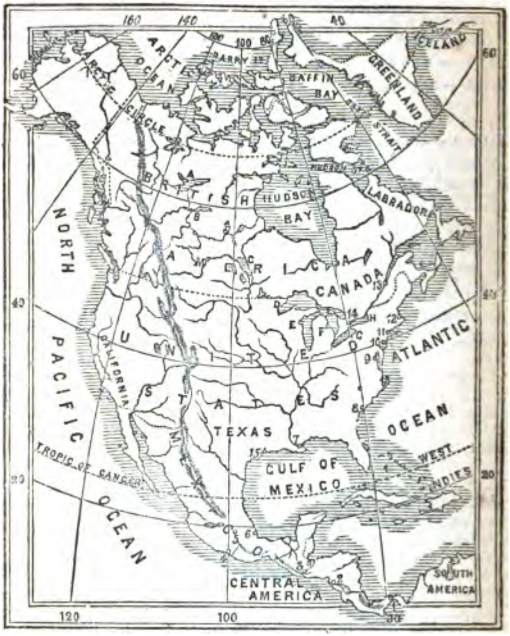
[a] Buenos Ayres, which was formerly at the head of La Plata or the Argentine Republic, separated from it in 1858.

NORTH AMERICA.



References to the Map of North America.

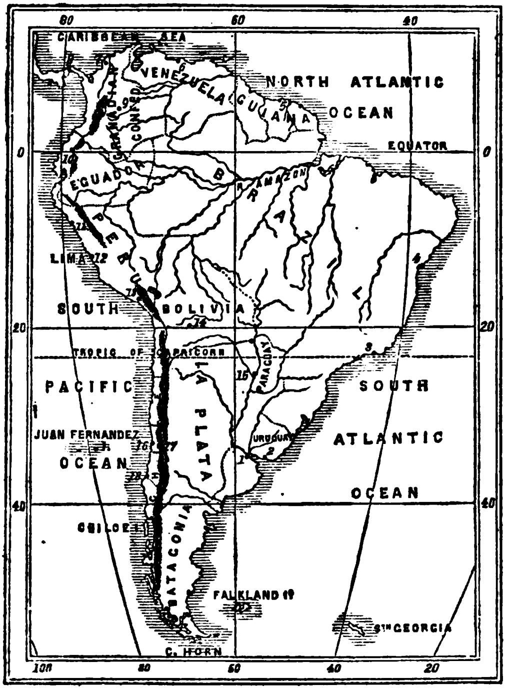
TOWNS.

Acapulco,	4	Leon,	2	Philadelphia,	10
Boston,	12	Mexico,	5	Quebec,	13
Charlestown,	8	New Orleans,	7	Toronto,	14
Guatemala,	3	New York,	11	Vera Cruz,	6
Galveston,	15	Panama,	1	Washington,	9

LAKES.

A Slave Lake.	C Winnipeg.	E Michigan.	G Erie.
B Athabasca.	D Superior.	F Huron.	H Ontario.

SOUTH AMERICA.



References to the Map of South America.

Arequipa, .	. 13	Lima, . .	. 12	Sta. Fe de-Bogota,	9
Assumption,	. 15	Monte Video,	. 2	St. Jago, .	. 17
Buenos Ayres,	. 1	Panama, .	. 8	St. Salvador,	. 4
Caraccas, .	. 6	Potosi, .	. 14	Surinam, .	. 5
Carthagena,	. 7	Quito, .	. 10	Truxillo, .	. 11
Conception,	. 18	Rio Janeiro,	. 3	Valparaiso,	. 16

THE WEST INDIES.

The West Indies consist of a large number of islands which extend in a curved direction from the coast of Florida to the delta of the Orinoco.[a] They may be divided into three principal groups, namely, the Bahama Islands, south-east of Florida; the Greater Antilles, east of the Gulf of Mexico, and north of the Caribbean Sea; and the Lesser Antilles, east of the Caribbean Sea. The Lesser Antilles are subdivided into three groups, namely, the Virgin Islands in the north, the Leeward in the middle, and the Windward in the south. The AREA is estimated at about 90,000 square miles, and the POPULATION at about 3½ millions, of which only about one-sixth are whites.[b]

1. The *Bahamas* or Lucayos Islands are about 500 in number, but many of them are mere coral reefs and islets.[c] The principal islands of this group are Great Abaco, Great Bahama, Andros, New Providence, Eleuthera, Guanahani or St. Salvador, and Long Island. *Guanahani* is the island on which Columbus first landed, and to which he gave the name of *St. Salvador.* Nassau, in New Providence, is the capital of the Bahama Islands.

2. The *Greater Antilles* comprise the largest of the West India Islands, namely, Cuba, Hayti or St. Domingo, Jamaica, and Porto Rico. The chief towns of Cuba are Havannah, Matanzas, and Santiago; of Hayti, Cape Haytien, Port au Prince, and San Domingo; of Jamaica, Kingston and Spanish Town (the capital); and of Porto Rico, San Juan. Of these islands Cuba and Porto Rico belong to Spain; Jamaica to Great Britain; and Hayti or St. Domingo is at present divided between two Negro republics, namely, the Republic of Hayti, and the Dominican Republic. To the former belongs the western, and to the latter, the eastern division of the island.[d]

3. The *Lesser Antilles* may be said to comprise the remainder of the West India Islands. They are subdivided into three groups—1. The Virgin Islands, the principal of which are Santa Cruz, St. Thomas, St. John, Tortola, Virgin Gorda, and Anegada. 2. The Leeward Islands, the largest of which are Anguilla, St. Martin, St. Bartholomew, Barbuda, St. Christopher, Nevis, Antigua, Montserrat, Guadaloupe, Mariegalante, and Dominica. 3. The Windward Islands, the principal of which are Martinique, St. Lucia, St. Vincent, Barbadoes,

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[a] The West India Islands lie between 10° and 27° north latitude; and between 19° and 85° east longitude.

[b] Negroes and mulattoes form the great bulk of the population; and, except in the British islands, in Hayti, and in the French islands (since 1848), they are, with few exceptions, slaves. In 1834, the British Parliament purchased, at the expense of *Twenty millions sterling*, the freedom of the slaves in the British West India Islands.

[c] These low groups are called *Keys* or *Cays*.

[d] During the French revolutionary wars, the slaves expelled the French from their portion of the island, and established the Negro Republic of Hayti. In 1849, it became an empire under Faustin I.; and in 1859 the empire was broken up by a revolution, the Negro emperor (Soulouque) banished, and a republic again established.

Grenada, Tobago, and Trinidad—to which may be added, Margarita, Buen Ayre, Curaçoa, and Oruba in the Spanish Main (off the coast of Venezuela).

BRITISH WEST INDIA ISLANDS.—1. Jamaica. 2. The Bahama Islands. 3. Trinidad (the largest of the Lesser Antilles). 4. Tobago. 5. Grenada. 6. Barbadoes. 7. St. Vincent. 8. St. Lucia. 9. Dominica. 10. Monserrat. 11. Antigua. 12. Nevis. 13. St. Christopher (or St. Kitts). 14. Barbuda. 15. Anguilla. 16. Tortola (Virgin Gorda, and Anegada).

PRINCIPAL TOWNS.—1. Kingstown, Port Royal, Spanish Town (the capital). 2. Nassau (in New Providence). 3. Port of Spain. 4. Scarborough. 5. St. George. 6. Bridgetown. 7. Kingstown. 8. Castries. 9. Roseau. 10. Plymouth. 11. St. John. 12. Charlestown. 13. Basse-Terre. 16. Road Town.

For the *Dutch* West India Islands, see page 264; for the *French*, page 238; for the *Danish*, page 261; and for the *Swedish*, page 258.

AREA AND POPULATION OF THE WEST INDIA ISLANDS.

Islands.		*Sq. Miles.*	*Pop.*	*Islands.*	*Sq. Miles.*	*Pop.*
Spanish,		46,250,	1,600,000	Dutch,	600,	30,000
Republics	Hayti,	11,000,	800,000	French,	350,	130,000
	Dominica,	18,000,	200,000	Danish,	180,	46,000
British,		13,500,	850,000	Swedish,	25,	10,000

MOUNTAINS.—The Blue Mountains, Jamaica; Copper Mountains, Cuba; Volcano of Morne Garou, St. Vincent; Volcano of Souffrière, Gaudaloupe. See page 69.

OCEANICA, OR OCEANIA.

Oceanica is a term used by modern geographers to denote a fifth great division of the globe. It is usually divided into Australasia, Malaysia[a] or the Indian Archipelago, and Polynesia. For the extent and population of Oceanica, see page 154.

AUSTRALASIA[b] comprises the large island—or rather continent of Australia—Tasmania or Van Diemen's Land, New Zealand, Papua or New Guinea, Timor Laut, the Aroo Isles, the Admiralty Isles, New Hanover, New Ireland, New Britain, Solomon Islands, Queen Charlotte Islands, New Hebrides, Espiritu Santo, New Caledonia, Norfolk Island, Auckland Islands, Chatham Island, Bounty Island, Antipodes Island, Campbell Island, and several others.

MALAYSIA, or the *Indian Archipelago*, comprises Sumatra, Borneo, Celebes, the Moluccas or Spice Islands (Gilolo, Ceram, and Amboyna), the Banda or Nutmeg Islands, the Manillas or Philippine Islands (Luzon, Mindanoa, &c.), the Sooloo Islands, Java, the Lesser Sunda Islands (Balli or Little Java, Sumbavi, &c.), Flores, Timor, &c.

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[a] The *Malaysian* Islands do not lie farther to the south than the tenth parallel; nor farther to the east than the meridian of 130°. They are, in fact, Asiatic Islands. See page 154.

[b] Australasia means *Southern* Asia; Malaysia, *Malayan* Asia (the inhabitants being principally *Malays*); and Polynesia is from two Greek words, signifying *many islands*.

The principal towns of *Sumatra* are Bencoolen, Palembang, and Acheen. Bencoolen and Palembang belong to the Dutch.

The principal towns of *Borneo* are Sarawak (formerly Kuchin), the capital of the Rajah, Sir James Brook; Pontianak and Banjermassin, belonging to the Dutch; and Brunai or Borneo, the residence of the Sultan, who is under the superintendence of the Rajah of Sarawak. Of *Celebes* the principal town is Macassar; of the *Philippine Isles*, Manilla; and of *Java* the chief towns are Batavia, Bantam, Samarang, and Sourabaya. *Batavia* is the capital of the Dutch possessions in the East. See page 264.

POLYNESIA.

Polynesia comprises the numerous islands which are scattered over the wide expanse of the Pacific Ocean, or Great South Sea. Geographers are not agreed as to their exact boundaries; but, generally speaking, they lie between the parallels of 30° N., and 30° S. latitude; and between the meridian of 130° E., and 130° W. longitude.[a] The principal groups, north of the equator, are the Sandwich Islands, the Caroline Isles, the Pelew Islands, the Ladrone[b] (or Marianne Islands), Gilbert Isles, Marshall Islands, and the Bonin Islands (south of Japan); and south of the equator, the Fejee Isles, the Friendly[c] or Tonga Islands (Tongataboo, the principal), the Navigators' Islands,[d] the Society Isles (Tahiti or Otaheite, the principal), Low Archipelago, and the Marquesas.—See page 238.

With the exception of Hawaii, Tahiti, and a few others, the Polynesian islands are very small; and they are, for the most part, either of coral or volcanic formation. The small islands, in particular, are based on coral formations; and they are in general so low that they rise only a few feet above the level of the sea. The islands of volcanic origin are more elevated, and some are mountainous; as the Marquesas, the Society, and the Sandwich Islands. In Hawaii, in the latter group, there are two volcanic mountains upwards of 13,000 feet high (Mouna Kea and Mouna Roa).

Though in the torrid zone, the climate of the Polynesian islands—owing to the cooling and refreshing breezes from the Ocean in which they are situated—is delightful and salubrious; and they are, in general, remarkable for the fertility of their soil, and the variety and luxu-

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[a] Some of the Polynesian Islands lie beyond these boundaries; as Pitcairn, Easter, and Pilgrim Island—and, strictly speaking, *New Zealand*; and several islands within these boundaries are included in *Australasia*; as the Papuan Archipelago (New Guinea, &c.)

[b] *Ladrōnēs*, that is, *thieves* (from the Latin *latro*, a robber). This name was given to the natives of these islands by the Spaniards, from their pilfering propensities. They were afterwards called the Marianne Islands, in honour of the queen of Philip IV. of Spain. The original inhabitants have almost all disappeared.

[c] *Friendly.*—This name was given to these islands by Captain Cook, from the apparent friendliness of the natives. Other navigators found them treacherous and cruel.

[d] This name was given to these islands by Captain Cook, because the natives seemed almost to live in their canoes, which they managed with great dexterity.

riance of their vegetation. Their principal vegetable productions are the bread-fruit tree, the cocoa-palm, bananas, plantains, yams, the sugar-cane, and the cotton-plant; and almost every kind of vegetable or fruit which grows in tropical or warm countries is found to flourish in them. See note, page 131.

The natives of the Polynesian islands are of two distinct races, the Malay and the Papuan or Austral-negro race. The former, who are by far the more numerous, are found in almost all the islands of Central and Eastern Polynesia. Like the natives of New Zealand, who are of the same family, they are in general, tall, well-made, active, and intelligent; but in their character and habits there is often a great diversity. Some of them are mild, simple, and docile; while others are cruel, treacherous, and savage in the extreme. The other or Papuan race, who were probably the original inhabitants of these islands, are now chiefly confined to the Fejee Islands, and the Papuan Archipelago. They are inferior to the other race both physically and intellectually; and indeed the Austral or Oriental Negroes may be considered as the lowest and most degraded of the human family. But even among them the labours of Christian missionaries have not been in vain; as in several of the Fejee Islands.

The Sandwich and Society Islands are the most important portions of Polynesia; and in these groups, Christianity, civilization, and commerce have made considerable progress. In the Sandwich Islands, the New Testament has been translated into the native tongue, schools have been established, churches built, and the usages and arts of civilized life introduced. They have also native-built vessels, manned with native sailors, trading to America and China. Honolulu, or Honorolu, in the Island of Oahu, is the chief port of the Sandwich Islands. It contains about 7,000 inhabitants; and it is the largest town in Polynesia. In these islands missionaries and settlers from the United States have the chief influence; and attempts have been made to annex them. The native population of the Sandwich Islands is about 80,000; and that of the Society Islands about 10,000.

AUSTRALIA.

The vast island of Australia forms the main portion of *Australasia*. It is 2,500 miles long by 1,800 broad, and its area is estimated at 2,800,000 square miles, that is, it is equal to more than three-fourths of the continent of Europe. See page 154.

In fact, Australia should be considered as a *fifth* Continent; and all the islands nearer to it than to Asia should be classed as belonging to it, that is, as *Australian* Islands instead of *Australasian*.

It lies between the parallels of 10° 40′ and 39° 12′ S. L., and between the meridians of 113° and 153° 16′ E. L. Its eastern and southern shores are washed by the South Pacific Ocean; its western and north-western, by the Indian Ocean; and on the north it is divided by Torres Strait and the Sea of Timor from Papua and the Indian Archipelago. The western coasts of Australia were discovered by Dirk Hartog, the captain of a Dutch merchant ship, in the year 1606, who gave it the name of *New Holland;* and it was subsequently visited by several navigators, including Dampier; but its eastern shores were first traced by Captain Cook in 1770, who then took formal possession of

the country in the name of Great Britain. To the country he gave the name of *New South Wales*, and to the first place where he landed, *Botany Bay*, from the beauty and variety of the flowers and plants which he observed in every direction. In 1788, Botany Bay was selected by the Government as a place of transportation for criminals; and this was the first British Settlement in Australia. This settlement was called New South Wales; but till convicts ceased to be sent to it, it made little or no progress as a colony. This took place in 1840, and since that period, and especially since the discovery of the Australian *Gold-fields* in 1851, the population of this, and the adjoining colonies—particularly Victoria—has been rapidly increased by the influx of immigrants from Great Britain and Ireland, and indeed from all parts of the world.[a]

There are at present five British colonies in Australia, which, with their principal towns, are as follows:—

COLONIES.—1. New South Wales. 2. Queensland (formerly Moreton Bay District). 3. Victoria (formerly Port Phillip District). 4. South Australia. 5. Western Australia.

TOWNS.—1. Sydney, Newcastle, Bathurst, Goulburn, Paramatta Windsor, Maitland, Liverpool, Campbeltown. 2. Brisbane. 3. Melbourne, Geelong, Castlemaine, Portland, Belfast, Kyneton. 4. Adelaide, Port Lincoln, Port Elliot. 5. Perth, Freemantle.

Each of these colonies is under a governor, appointed by the Crown; but the governor of New South Wales ranks as Governor-General of all the British possessions in Australia.[b]

MOUNTAINS.—The Australian Alps or Warragong Mountains in the extreme south-east of the continent—partly in Victoria, and partly in New South Wales; the Blue Mountains, and the Liverpool Mountains (a continuation of them northward), in New South Wales; Flinder's Range, and Gawler's Range, in South Australia; and Darling Range, in Western Australia. *Koskiusko*, one of the highest summits of the Australian Alps, is 6,500 feet above the level of the sea. Its summit is covered with perpetual snow. See page 64.

RIVERS.—The Murray is the largest river in Australia. It rises in the Australian Alps, and, after a course of about 1,200 miles, flows into Encounter Bay. Its principal tributaries are the Darling, Lachlan, and Murrumbidgee. There are many other rivers in Australia, but

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[a] In 1810, the whole white population of New South Wales (which, was then, and up to 1829, the only colony in Australia), amounted to but 8,300 persons. In 1821, the population had increased to nearly 30,000; and in 1833, the number of whites in the colony was 60,794. Of these 60,794 persons, two-fifths were convicts in actual bondage, and one-half of the remaining number were ticket-of-leave men or liberated convicts. The white population in Australia at present is little short of a million.

[b] In 1850, a law was passed by the British Parliament which gave to the Australian Colonies the power of independent legislation by means of a representative system; and they all, with the exception of Western Australia, availed themselves of the privilege. The form which they adopted is in accordance with the British Constitution, namely, an Upper and Lower House. The former is called the Legislative Council, and the latter, the Legislative Assembly.

they are usually very short; as the Brisbane, Clarence, Macleay, Hastings, Hunter, Hawkesbury, Yarra-Yarra, Swan River, &c.

GULFS, BAYS, &c.—On the *north* Torres Strait, Gulf of Carpentaria, Melville Bay, Port Essington, Van Diemen's Gulf, Cambridge Gulf; on the *east*, Princess Charlotte Bay, Halifax Bay, Broad Sound, Moreton Bay, Botany Bay; on the *south*, Bass Strait, Western Port, Port Phillip, Encounter Bay, Gulf of St. Vincent, Spencer Gulf, Great Australian Bight, King George's Sound; on the *west*, Flinder's Bay, Geographè Bay, Shark Bay, Exmouth Gulf, King's Sound, Camden's Sound, and Admiralty Gulf.

CAPES.—The principal capes are York, Melville, Flattery, Sandy, Howe, Wilson's Promontory, Otway, Northumberland, Spencer, Chatham, Leeuwin, N. W. Cape, Leveque, Londonderry, and Point Dale.

LAKES.—Victoria or Alexandrina and Torrens are the largest. The former is an expansion of the Murray before it falls into Encounter Bay; and the latter, which is in the north of South Victoria, is salt. Both of these lakes are shallow, particularly the latter, which is rather a marsh than a lake.

ISLANDS.—On the *north*, Bathurst, Melville, Groote Eyland (*Great Island*), Wellesley, Cook's Island; on the *east*, Great Sandy Island; on the *south*, the Furneaux Isles, King's Island, Kangaroo Island; on the *west*, Dirk Hartog's Island, and Dampier's Archipelago.

The original inhabitants of Australia are of the Papuan or Austral-Negro race. They are not numerous; and they are evidently decreasing. See page 311.

VAN DIEMEN'S LAND OR TASMANIA.

The large and important island of Van Diemen's Land or *Tasmania* (as it has been called since 1852, when it ceased to be a Penal colony), lies to the south of Australia, from which it is separated by Bass Strait. Its area is estimated at about 23,000 square miles; and its present population amounts to nearly 100,000. It forms a sixth Australian Colony (*Tasmania*), under a Governor appointed by the Crown. It, however, like the other colonies in the mainland, is subject to the Governor of New South Wales as Governor-General.

The principal towns are Hobart Town (the Capital), Launceston, George Town, and Port Arthur. The original inhabitants of Tasmania have all disappeared. They were of the same race as the natives of the mainland. The climate of Tasmania is delightful, and salubrious; and it will doubtless soon become a populous and flourishing colony.

NEW ZEALAND.

New Zealand consists of two large and one small island, besides several small islands which lie adjacent to them, but of less note. The total area of the group is estimated at upwards of 120,000 square miles, that is, it is about equal to the united areas of Great Britain and Ireland. The native population, which is evidently decreasing, is about 60,000; and the British settlers in 1858 amounted to 55,600, exclusive of the military. The number is at present nearly 70,000. The two large islands of New Zealand are called respectively, New Ulster, or

the North Island, and New Munster, or the Middle Island; and the small island (formerly Stewart Island), is called New Leinster, or the South Island. The two large islands are separated from each other by Cook's Strait; and the more southward of them is divided from the third island by Foveaux Strait.

New Zealand was first formally taken possession of as a British Colony in 1840. It is divided into seven provinces, which are under the government of a Legislative Council, a House of Representatives, and a Governor appointed by the Crown, who resides at *Auckland*, the capital of the colony. The names of the provinces, and their principal towns, are as follows:—

In the North Island.		*In the Middle Island.*	
Auckland,	Auckland.	Nelson,	Nelson.
Wellington,	Wellington.	Canterbury,[a]	Christchurch, Lyttleton.
New Plymouth,	Taranaki.		
Hawke Bay,	Napier.	Otago,[a]	Dunedin, Port Otago.

MOUNTAINS.—High chains of mountains extend through both the North and Middle islands, the highest summits of which are covered with perpetual snow. Mount Egmont is the highest. See page 70.

The native New Zealanders or *Maories*, as they call themselves, are of the Malay race, and are generally tall, well-formed, and muscular. Many of them have been converted to Christianity. See page 138.

ANTARCTICA.

This term has been applied to several islands and some extensive tracts of land which have been discovered of late years within or near the *Antarctic* circle. These tracts of land are supposed to form portions of a *Southern Continent*. The principal, and farthest to the south, is *South Victoria*, which was discovered by Sir James Ross in 1841, who traced its shores from latitude 70° to 79°. It is covered with perpetual snow; but its most striking feature is Mount Erebus, an active and tremendous volcano. It is 12,400 feet high; and its flames, rising high above its lofty crater, throw a terrific light over these dreary and desolate regions. To the eastward of it there is another volcano called Mount Terror. It is 10,900 feet high; and they both owe their names to the celebrated exploring ships, the *Erebus* and the *Terror*.

The other tracts of land are Graham, Enderby, and Adelie Lands, which lie just without the Antarctic circle; and Sabrina Land, which is much farther to the south (in latitude 75°).

The principal *Antarctic* islands are the South Shetland Islands, the South Orkney Islands, South Georgia, Sandwich Land, and the Balleney Islands. To these may be added some islands, which, though lying much farther to the north, are of the same desolate character; as Kerguelen's Land, Prince Edward Island, Marion, Crozet's, Amsterdam, and St. Paul's Islands, and Tristen da Cunha. See page 66.

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[a] The Canterbury Settlement, which was established in 1849 by some zealous members of the Church of England, has merged into the general colony; and the same may be said of the Port Otago Settlement, which was established in 1848, in connexion with the Free Church of Scotland.

GENERALIZATION OF THE

CLIMATES AND PRODUCTIONS OF THE EARTH.

INSTEAD of obliging children to learn the climates and productions of every country in the world *separately*, which even if they could, it would be impossible for them to recollect, it is much better to begin by giving them general views of the principal productions of the GREAT DIVISIONS OF ZONES, into which the earth's surface has been divided. In this way, the knowledge of a few general principles will enable them to form tolerably correct ideas of the climate and productions of every country in the world, by merely knowing the *division* or zone in which it is situated.

With this view the earth may be divided into SEVEN great CLIMATES or regions, namely, the *Equatorial*, the *Tropical*, the *Warm*, the *Temperate*, the *Cold*, the *Frozen*, and the *Polar* regions. The *isothermal* lines described in the Fifth Chapter will enable the pupils to trace the general boundaries of each of these great divisions of the earth. They should, therefore, make themselves perfectly acquainted with the general direction of each of these *lines*, and with the principal productions which characterize each *zone* or *division*. It is stated in the chapter referred to, that the *Equatorial* region extends about twenty degrees on each side of the equator, and that the most delicate spices, as cinnamon, cloves, nutmeg, and pepper, are confined to this great band of the earth. It has therefore been designated as the region of the *spices*. In like manner, the other great divisions of the earth have been designated from the principal productions by which they are characterized; as the region of the *sugar-cane* and *coffee-tree*; the region of the *fig* and *olive*; the region of the *wine-grape*; the region of the *oak* and *wheat*; the region of the *fir*, *pine*, and *birch*; and the region of *alpine shrubs*, *lichens*, and *mosses*.

It is not to be supposed that the plants and vegetables here specified are confined to the regions which have been called by their names; still less that these are the only productions which are found in perfection in those parts of the earth. Every plant, in addition to a genial soil, requires a certain degree of temperature to bring it to maturity; and in every part of the world in which vegetables find a soil and climate suitable to their nature, there we are to expect them in the greatest perfection.

We shall now enumerate a few of the other vegetable productions by which the principal zones are characterized.

The *Equatorial* division of the earth, in addition to the finest spices, by which it is particularly characterized, produces in the greatest perfection, aromatic and medicinal gums, balsams, and juices; also myrrh, frankincense, camphor, and cassia. The guava,

banana, tamarind, pine-apple, and other delicious fruits abound in those regions. The breadfruit-tree, the plantain, the sago, and other species of the palm-tree; and the yam, cassavi, manioc, and arrow-root, serve as substitutes for wheat, oats, barley, and rye, which could not be grown in those regions, except in elevated and mountainous districts.

Rice, and maize or Indian corn, are natives of hot climates, and hence they are produced in great abundance in the equatorial and tropical regions where the soil is suitable.

In the forests of those regions are found the hardest, most durable, and most beautiful kinds of timber, as iron-wood, teak, ebony, mahogany, sandal-wood, rose-wood, &c.

In the *Tropical* regions are found, with the exception of the finest spices, all the plants and productions of the equatorial zone. And here in the greatest perfection are found the *sugar-cane*, *coffee-tree*, *cocoa-nut*, and all the other species of the palm-tree.

The orange, lemon, and citron, are found here with the most delicious flavour.

Indian corn or maize, and rice, are produced in great abundance in tropical climates; also cotton, tobacco, indigo, drugs, and dye-woods.

In the *Warm* regions, the olive and fig are found in the greatest perfection; and towards the tropical borders, the orange and lemon. Almonds, peaches, apricots, flourish here; also the mulberry, so essential to the production of silk; and the vine, from which the choicest wines are produced. Wheat, too, is produced in great perfection here, particularly towards the temperate borders.

The cork-tree, drugs, barilla, shumac, dried fruits, are products of those regions.

In the *Temperate* regions, the different kinds of grain are produced in great perfection; also the oak, beech, maple, and other trees valuable for timber.

Towards the borders of the warm regions, grapes, almonds, peaches, and apricots, are produced in perfection; also plums, cherries, apples, and pears, particularly towards the borders of the next great division.

The principal vegetable productions of the *Cold* regions are *pine* and *fir* timber, oats, barley, and rye. The fruits are apples, pears, nuts, gooseberries, strawberries, &c.

In the *Frozen* and *Polar* regions, there is scarcely any vegetation; but from those parts of the world we obtain valuable *animal* productions, as whalebone, train oil, and the *furs* of commerce.

ANIMALS.

The torrid zone is as remarkable for the great number and large size of its *animals*, as it is for the rank luxuriance of its vegetables. In it are found the most *gigantic* animals, as the elephant, the hippo-

potamus,[a] and the rhinoceros; and the fiercest and most formidable *beasts of prey;* as the lion, the tiger, the leopard, the panther, the ounce, the hyena; and the jaguar, and puma or cougar of South America. Some of the animals, however, peculiar to those regions, are not only harmless and beautiful, but in the highest degree useful to man; as the zebra, the giraffe or camelopard, the antelope, the camel, and the dromedary; and in the new world, the lama and the vicuna.

REPTILES of the most enormous size, as the boa constrictor, and of the most venomous nature, as the cobra da copella, are natives of the torrid regions.

The LIZARD tribe are equally gigantic and formidable; as the crocodile of Africa, the alligator and cayman of America, and the gavial of India.

The whole tribe of QUADRUMANA; as baboons, apes, and monkeys, belong to those climes.

The BIRDS of those regions have usually the most brilliant and beautiful plumage; and some of them rival quadrupeds in size and strength; as the ostrich, the cassowary, and the condor.

Even the INSECTS in those regions are formidable, from their number and destructive powers. Locusts, and even flies, often lay waste countries, and drive nations before them.

The seas in those climates abound in FISH, most of which shine with brilliant and beautiful colours; and some of them, as the shark, display the ferocity of the wild beasts of the forests. The SHELL-FISH are larger and much more brilliant than those of the more temperate climes.

TEMPERATE REGIONS.

In the temperate zones the animal tribes diminish in number, size, and ferocity. The beasts of prey are chiefly the wolf, the wild boar, and the wild cat. Domestic animals, however, as the ox, and the horse, are reared in great perfection in these regions.

The REPTILE tribes gradually diminish in the temperate regions, and, as we approach the frigid zone, they disappear altogether.

POLAR REGIONS.

In approaching the 60th degree of latitude, the animals of the temperate regions become small and stunted; and a little beyond this their place is supplied by a new creation of animals; as the elk, the rein-deer, the moose-deer, the martin, the sable, the ermine, &c. But in approaching the polar or frozen regions, fierce and formidable animals are found, as the white bear, the walrus, and other monsters of the deep. See note, page 134.

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[a] Some of these animals seem confined to particular parts of the torrid zone, and some of them are found a considerable way beyond it, but with diminished size and ferocity. Thus, the hippopotamus seems peculiar to the rivers of Africa, and the two-horned rhinoceros to the southern part of the same continent. Africa is also the peculiar abode of the royal lion; those which are found in India, and some other parts of Asia, are much smaller, and nearly destitute of a mane. The royal tiger is peculiar to India, though it sometimes strays as far northward as Chinese Tartary.

MINERALS.

The distribution of minerals does not, like that of animals and vegetables, depend upon climate; hence, they are found in every part of the globe; and, it is remarkable, that those which are the most useful to man are the most widely distributed, and found in the greatest abundance. It is also remarkable, that those portions of the earth which are found to be unfit for the support of animal and vegetable life, are usually rich in mineral treasures. *Gold*, the most precious of all the metals, is found in all the great divisions of the globe.[a]

Till the gold fields in California, Australia, and British Columbia were discovered, Mexico and Peru produced gold in far greater abundance than any other countries in the world. Brazil also produces large quantities of gold, both from alluvial sands and mines. Africa furnishes large quantities of gold. It is found chiefly in the sands of the rivers in Western Africa or *Guinea*, and in countries about the *Gold* Coast. It is also found on the coast of Zanguebar, and among the mountains of Mozambique.

Gold is found in many parts of Europe, but no where in large quantities. Alluvial gold has been found in Ireland, Scotland, and several countries of Europe: and the sands of the Danube, the Tagus, the Rhine, the Rhone, and the Garonne, contain small quantities of it. The mines of Kremnitz, in Hungary, were usually considered the most important; but the subsequently discovered mines in the Ural Mountains are far more productive. See page 198. Gold is also found in Siberia or Northern Asia; and in the islands of Sumatra, Borneo, Celebes, &c.

Platina is a very scarce metal. It is usually found in connexion with gold; as in the gold washings of South America, and in the Ural Mountains, from which the principal supplies of it are obtained.

Silver, as well as gold, is found in unequalled abundance in Mexico and South America, particularly in Peru, Chili, and Buenos Ayres. It is usually found in ores, but frequently pure, and in large masses.[b]

The most valuable silver mines in Europe are those of Schemnitz and Kremnitz, in the Austrian dominions. The mines of Kongsberg, in Norway, have produced large masses of pure silver. It is also found, but in small quantities, in several other countries of Europe.

Silver is also found in several parts of Siberia, and in China and Japan. Scarcely any *silver* has been found in Africa; but scarcely any mining attempts have been made there.

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[a] It is usually found in a perfectly pure state, either in small masses, or in grains or gold dust; and more than the half of the whole quantity obtained is found in alluvial soils, near the base of great mountain ranges, or in the sands of rivers. The remainder is extracted from mines. In the gold-fields of Australia, it is often found in large lumps or masses which they call *nuggets*.

[b] The celebrated Potosi mines were accidentally discovered by an Indian. In climbing up the mountain, he caught hold of a small bush, which giving way, presented to view, under its roots, large masses of silver. Huantaya in Peru, and Guanaxuato in Mexico, are the most productive mines. The latter has a vein of silver ore 180 feet wide and 1,600 feet deep.

Iron, the most useful of all the metals, is the most widely and the most abundantly distributed. It is found in almost every country in the world, but more extensively in the temperate than in the tropical regions. The principal ores are the magnetic ore and iron-stone of mountainous regions; and the bog-iron, and iron earth, of alluvial districts. The most extensive iron mines in the world are in Great Britain. France has also very extensive iron mines. Sweden contains large mines of magnetic iron-stone, which produces the best bar-iron. In Swedish Lapland, at Gellivara, there is a mountain of iron-ore three miles in length. Norway and Russia have also extensive iron mines. Elba contains one of the most ancient mines of iron, the ore of which is remarkable for the beautiful play of its colours.[a] In the United States, particularly along the Alleghanies, there are numerous and inexhaustible beds of iron-ore.

Copper ranks next to iron in utility. It is found in most regions of the globe, and often in pure metallic masses. England has the most extensive copper mines in the world. In Cornwall, in particular, this metal is most abundant. There are also considerable mines in Norway, Sweden, Austria, and Russia; but England produces as much as all the rest of Europe. Copper is also found in Siberia and Chinese Tartary. Japan produces copper of superior excellence. This metal is also found in Morocco, Nigritia, and in Southern Africa. It is also found in the southern part of South America, and in the northern extremity of North America, about the mouth of the *Coppermine* River. It is also found in large quantities in Australia; the *Burra-Burra* mines being about the richest in the world.

Zinc, the metal which is combined with copper to form *brass*, is found in many countries in considerable quantities.

Lead is found more or less in almost every country. In Peru, and the Ural Mountains, it is very rare, though other metals are abundant. It is found in large quantities in the British Islands, and is very abundant in Spain. There are also considerable mines of this metal in France, Austria, and Germany; but Great Britain and Spain supply, in nearly equal proportions, about six-sevenths of all the lead produced in Europe.

The lead mines in Missouri, near the Mississippi, are said to be the richest in the world. The ore is found abundantly, a foot or two from the surface, in detached masses, weighing from one to 1,800 pounds.

Tin is found in few countries. The most extensive, and the most ancient mines in the world, are in Cornwall in England. The mountains of Saxony, Bohemia, and Galicia in Spain, supply considerable quantities; but England yields about twelve-thirteenths of all the tin produced in Europe.

Tin is found in Mexico and Chili, but in small quantities. It is also found in India, Malacca, Japan, Sumatra, and particularly in the island of Banca, in the neighbourhood of Sumatra.

Mercury, or *quicksilver*, is found in several parts of the globe, but only in small and detached portions. The principal mines are in Idria in Hungary. There are also mines at Almaden, near Cordova in Spain, Deuxponts in Germany, and Guenca Velica in Peru. Mercury is also found in Mexico, New Grenada, and China.

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[a] Insula inexhaustis chalybum generosa metallis.—*Æneid*, x. 174.

Cobalt, which is chiefly used for giving a blue colour to glass and porcelain, is procured principally from Germany.

Arsenic is found in most of the mining districts of Europe; but it is chiefly obtained from Germany, and the countries on the Mediterranean. Some of its ores form brilliant colours for the painter.

Antimony and *bismuth* are brittle metals. They are combined with lead to form the metal of which printing types are made. They are also principally obtained from Germany.

The other metals described by the mineralogists, as *manganese*, *nickel*, &c., are of less importance.

COMBUSTIBLE OR INFLAMMABLE MINERALS.

Coal, of all the mineral treasures, is perhaps the most important. It is found in the greatest abundance in England and Scotland. It is also found in Belgium, Prussia, and France. See pages 198 and 214.

Coal is also found in great abundance in many parts of America, as in Cape Breton, New Brunswick, Pennsylvania, &c. Humboldt found coal at a very great elevation in the Andes. Coal is also found in large quantities in China, Australia, &c.

Sulphur is most abundant in volcanic countries; and seems to be an important part of the fuel which feeds their fires. It exudes from the earth in volcanic districts, as in the Solfa Terra of Naples, and is principally found in the craters of extinct volcanoes. Sicily, Naples, and Iceland, abound with it. It is also found in Spain, and in some of the West India Islands, as Guadaloupe, Martinique, and Montserrat. It is also often collected in considerable quantities from *sulphureous* springs.

Amber is found frequently in alluvial districts; but it is procured almost entirely from the coasts of Prussia.

The other inflammable minerals, as *naptha*,[a] *petroleum* or mineral oil, and *bitumen* or mineral pitch, are found in many parts of the world, but principally in Asia. They are used for lamps, for medical purposes, for varnish, and, anciently, for cement.

SALINE MINERALS.

Salt is a mineral of the utmost importance to man, and is found in every part of the world in great abundance. The ocean itself is an inexhaustible mine of salt, from which, in warm countries (as in the Cape Verde Islands), it is formed by the heat of the sun, and in colder regions, by means of artificial heat. In Cheshire in England, there is an extensive bed of salt, from 60 to 90 feet thick. In France, Germany, and Hungary, there are also extensive mines; but those of Wie-

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[a] *Naptha* is bitumen in its purest state. It is a whitish transparent fluid. *Petroleum* is bitumen in an oily or less pure state; and *asphaltum* is bitumen in a pitchy or hardened state. *Baku*, near the Caspian Sea, is celebrated for its bituminous springs. The soil, for several miles round, so abounds with naptha and petroleum, that wells dug in the sand yield large quantities daily. And in Burmah, near Rangoon, there are petroleum springs which furnish, it is stated, about 10,000 hogsheads annually for commerce. Petroleum is also found in Modena and Parma in Italy. Asphaltum is found floating on the surface of the Dead Sea in large quantities; and the Pitch Lake, in the Island of Trinidad, is often covered over with it like a crust.

litzka, near Cracow in Poland, are the most extensive and the most celebrated in the world.

Salt sometimes forms *mountains*, as at Cardonna, near Montserrat, in Spain. In Moldavia in Turkey, there is also a mountain of salt; and in Hindostan, there is a range of hills entirely composed of salt, extending across the Indus, through Cabool. There are also large *plains* incrusted or covered with salt, in many parts of the earth, as in Abyssinia, the Sahara, Persia, the Desert of Atacama, Siberia, &c. See page 94.

Salt or *brine springs* are also numerous in many parts of the world. They are formed by passing through beds of salt.

Nitre is found in large quantities in several of the plains of Spain, Hungary, Russia, and Persia. It is also found in the earth of calcareous caves, in India, Java, Naples, &c.

Borax, a salt used in soldering metals, is found in lakes and caverns in Tibet, Persia, Hungary, &c.

Ammonia, or volatile salt, is found principally in the neighbourhood of volcanoes; as in Iceland, Naples, Sicily, and the Lipari Isles.

Soda or *barilla*, is obtained from the ashes of marine plants. It is procured principally from Spain and other countries on the Mediterranean. It is also found in beds, as in La Plata. Soda is also called *natron*. See page 99.

The following TABLE, which exhibits at one view the chief productions and EXPORTS of the principal countries in the world, illustrates the GENERAL PRINCIPLES just laid down.

Countries.	*Exports.*
Asiatic Islands, .	Cinnamon, cloves, nutmegs, pepper, ginger.
Australia, . .	Gold, copper, wool, tallow.
Hindostan, . .	Cotton goods, silk, sugar, coffee, pepper, indigo, rice, lac-dye, saltpetre, precious stones.
Birman Empire, .	Teak timber, rice, indigo, gums, drugs, palm sugar, cotton goods, silk, varnish.
China, . . .	Tea, silk, cotton goods, porcelain, lacquered ware, gums, paper, drugs.
Japan, . . .	Silk and cotton goods, drugs, spices, varnish, porcelain, rice, cedar.
Persia, . . .	Silks, carpets, cotton goods, shawls, stuffs, sugar, rice, dried fruits, leather, drugs, tobacco.
Arabia, . . .	Coffee, aloes, gums, myrrh, frankincense, perfumes, drugs.
Africa, . . .	Palm-oil, teak timber, aloes, dye-woods, ostrich feathers, ivory, gold, dates, gums, sugar (from the Mauritius).
Turkey in Asia, .	Coffee, carpets, silks, fruits, drugs, opium.
West Indies, . .	Sugar, coffee, rum, molasses, cotton, pimento, ginger, logwood, mahogany, cocoa, cochineal, cigars.
Mexico, . . .	Silver and gold.
Caraccas, . .	Cocoa, coffee, indigo, tobacco.
Guiana, . . .	Sugar, rum, cotton, coffee, tobacco, indigo cayenne-pepper.

Countries.	*Exports.*
Brazil, . . .	Cotton, sugar, coffee, tobacco, dye-woods, drugs from the northern provinces; gold and diamonds from the middle; and wheat, hides, and tallow from the southern.
Buenos Ayres, .	Gold and silver, hides, beef, tallow.
Peru, . . .	Silver and gold.
Chili, . . .	Silver, gold, and copper, from the northern provinces; wheat and hemp from the southern.
Morocco, . .	Leather, goat-skins, gums, fruits.
Algiers and Tripoli,	Ostrich feathers, dates, wax, wool.
Egypt, . . .	Cotton, indigo, drugs, fruit, rice.
Madeira Islands, .	Wine, fruits.
Canary Islands, .	Wines, fruits, silk, barilla.
Turkey and Greece,	Figs, raisins, currants, raw silk, oil.
United States:	
Southern States,	Cotton, tobacco, rice.
Middle States, .	Wheat, flour; and from Maryland, tobacco.
Northern States,	Timber, fish, beef, pork, pot and pearl ashes.
Spain and Portugal,	Olive-oil, wines, raisins and other dried fruits, lemons, oranges.
Italy, . . .	Thrown silk, olive-oil, currants, lemons, oranges, wine, barilla, shumac, cheese, straw-hats.
France, . . .	Wines, brandy, silk (raw and manufactured), gloves, madder, fruits, perfumery, trinkets.
Germany, . .	Wool, corn, wines, linens, clover and rape seeds, wooden clocks.
Netherlands, . .	Fine linen, lace, butter, cheese, corn, madder, geneva, flax, seeds, toys.
Great Britain, .	Cottons, woollens, linens, hardware, salt, coals, iron and steel, earthenware, glass, machinery, fire-arms.
Ireland, . . .	Cattle, corn, linen, beef, bacon, butter, hides.
Prussia, . . .	Corn, timber, flax, bark.
Denmark, . .	Corn, rape-seed, fish, hogs.
Sweden, . . .	Timber, iron, bark.
Norway, . .	Timber, turpentine, fish.
Russia, . . .	Tallow, corn, flax, hemp, flax-seed, ashes, timber, tar, furs.
Canada, . . .	Timber, corn, pot and pearl ashes, furs.
Newfoundland, .	Cod-fish.
Nova Scotia, . .	Timber, dried fish, plaster of Paris.
Hudson's Bay, .	Furs, procured from the Indians.
Columbia River, .	Furs, procured from the Indians.
Kamtschatka, .	Furs and dried fish.
Siberia, . . .	Furs and minerals.
Greenland, . .	Whale-oil, whale-bone, the produce of the Fisheries.
Polynesia, . .	Sandal-wood, cocoa-nut oil, arrow-root.[a]

[a] See page 311.

SACRED GEOGRAPHY.

PALESTINE, or the HOLY LAND, is properly a part of Syria.[a] It is bounded on the north by Phœnicia and Syria;[b] on the east by Syria and Arabia Deserta; on the south by Arabia Petræa; and on the west by the Mediterranean Sea.

This tract of country was originally inhabited by the descendants of Canaan, the grandson of Noah, and hence it was called the *Land of Canaan.*[c] It was afterwards called Palestine, from the *Philistines*,[d] who occupied the southern coasts; and Judea, from *Judah*, the chief tribe of the Israelites. It was also called the Land of Promise, the Holy Land, &c.

The limits of the country to which these names were applied, varied at different times; but, generally speaking, the greatest length of Palestine was nearly 200 miles; and its greatest breadth about 100 miles.

Palestine was differently divided at different times. When Joshua took possession of it, he divided it among the twelve tribes of Israel—Reuben, Simeon, Judah, Issachar, Zebulun, Manasseh, Ephraim,[e] Benjamin, Dan, Naphtali, Gad, Asher.

LOCATION OF THE TWELVE TRIBES.

Between the Dead Sea and the Mediterranean, were the tribes of Judah, Simeon, and Dan.

On the west side of the Jordan, were the tribes of Benjamin, Ephraim, half tribe of Manasseh, and the tribe of Issachar.

On the east side of the Jordan, were the tribes of Reuben, Gad, and the half tribe of Manasseh.

On the western side of the Sea of Galilee, were the tribes of Zebulun and Naphtali.

North-west, on the Mediterranean, was the tribe of Asher.

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[a] SYRIA, generally speaking, lies between the Euphrates on the east, the Mediterranean on the west, Mount Taurus on the north, and Arabia on the south.

[b] A line drawn from Damascus to a little to the southward of Tyre, will give its northern boundary. It extends from 31° to 33° 35′ N.L.; and from 34° 30′ to 36° 25′ E. L.

[c] The Sidonians, Hittites, Jebusites, Amorites, Hivites, &c., were also the descendants of Canaan, and the name *Canaanites* was originally applied to all; but it was afterwards restricted to a particular tribe.

[d] The Philistines were descended from Mizraim, the second son of Ham, and were originally settled in Egypt; whence they emigrated, and possessed themselves of all the country from Gaza to Joppa.

[e] Manasseh and Ephraim were properly a single tribe, being descendants of Joseph. The tribe of Levi had no portion assigned to them. They subsisted on offerings, first fruits, and tenths; and particular cities in the land of each tribe were appointed for their habitations.

It was afterwards divided[a] into the two kingdoms of Judah and Israel; and lastly by the Romans into four provinces or districts, namely, Galilee, Samaria, Judea Proper, and Peræa, or the Country beyond the Jordan.

In GALILEE,[b] the chief places were—Cana, Chorazin, Capernaum, Bethsaida, Tiberias, Bethlehem, Nazareth, Nain, Zebulun, Accho or Ptolemais, now Acre.

In SAMARIA,[c] the chief towns were—Samaria, Sychem or Sychar, and on the coast, Cæsarea and Joppa.

In JUDEA, the chief towns were—Jerusalem, Jericho, BETHLEHEM, Ephraim, Bethel: also Gaza, Gath, Ascalon, Azotus or Ashdod, and Ekron, in the country of the Philistines.

In PERÆA, or the COUNTRY BEYOND THE JORDAN, the chief towns were—Cæsarea Philippi, Bethsaida or Julias, and Bethabara.

South of the Dead Sea was Idumæa or Edom, and the Land of Midian; but these countries are properly a part of Arabia.

MOUNTAINS.—On the north, *Libănus* or *Lebanon*, divided into two ranges—Libanus on the west, and Anti-Libanus on the east; *Hermon*, *Mount Carmel*, *Gilead*, *Tabor*, *Gilboa*, the mountains of *Abarim*, the most remarkable of which are, the *Heights of Baal*, *Pisgah*, and *Nebo* (on which Moses died). *Mount Seir* is in Idumæa or Edom; and *Mount Sinai*, between the two branches of the Red Sea. *Horeb* adjoins Sinai, and is, in fact, a peak of the same mountain. See page 74.

RIVERS.—The *Jordan*,[d] which rises in the mountains of Anti-

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[a] In consequence of the revolt of the ten tribes in the reign of Rehoboam the son of Solomon. The tribes of Judah and Benjamin, which alone remained faithful to the house of David, formed the kingdom of Judah; the other ten tribes, the kingdom of Israel.

[b] The Galileans were composed partly of the remnant of the ten tribes, and partly of Gentiles. Hence, the Jews (of Judah and Benjamin) regarded them as an inferior and degenerate race. In Galilee our Saviour spent the greater part of his life; it was the scene of many of his miracles, and from its inhabitants he selected most of his disciples.

[c] When the ten tribes were carried away captive into Assyria, a number of Assyrians were introduced into their country, who mingled with the Israelites that were left, and with those who afterwards returned. Hence, the Jews (who called them Samaritans, from *Samaria*, their capital) regarded them as little better than Gentiles, and the greatest aversion existed between the two nations. The separation of the ten tribes, the opposition of the Samaritans to the rebuilding of the Jewish temple after the Babylonish captivity, and their ill-treatment of the Jews who passed through their country to worship at Jerusalem, instead of going to Mount Gerizim, account for the hatred and hostility between the two nations.

[d] *Jordan*, that is, the *river of Dan*, so called from a town near its source.

Libanus, and flows through the waters of Merom, and the Sea of Galilee into the Dead Sea; the *Waters of Lebanon*, which flow into the Mediterranean; the *Arnon*, which rises in the chain of Gilead, and falls into the Dead Sea; the *Kishon*, which flows into the Mediterranean, north-east of Mount Carmel; and the Brooks, *Jabbok*, *Kedron*, &c.

LAKES.—The *Dead Sea*,[a] the *Sea of Galilee* or *Tiberias*,[b] called also the *Lake of Gennesareth*; the *Waters of Merom*.

ANCIENT GEOGRAPHY.

THE PRINCIPAL COUNTRIES KNOWN TO THE ANCIENTS.

ASIA.

CHALDÆA, in the earliest ages of the world, comprised the countries between the Euphrates and Tigris near their junction; but the name was afterwards given to the country south-west of the Euphrates. Chaldæa may be regarded as the cradle of mankind, as it was in that part of the earth that the garden of Eden was situated. It was afterwards called Babylonia, from its metropolis *Babylon*, the most celebrated city of antiquity. This country is now called Irak-Arăbi, and the chief cities are *Bagdad* and *Bassŏra*.

ASSYRIA originally meant the country to the east of the Tigris; but the name was afterwards frequently extended to Syria. Assyria took its name from *Asshur*, one of the descendants of Shem. Its chief city was the celebrated *Nineveh*, which stood on the banks of the Tigris, near, it is supposed, the site of the village of *Nounia*, in the neighbourhood of Mosul.

SYRIA comprised all the countries between the Euphrates and the Mediterranean on the one hand, and between Arabia and the branches of Mount Taurus on the other. *Damascus*, which existed in the days of Abraham, was the chief city of Syria. It is still a large and flourishing town. Between the Orontes and the Euphrates, about 170 miles north-east from Damascus, stood *Palmyra* or "Tadmor in the Desert." Its magnificent ruins are scattered over an extent of several miles. *Baalbec* or *Heliopolis*, that is, the city

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[a] *Dead Sea.*—This lake is also known in Scripture by the names of the *Salt Sea*, the *Sea of the Plain*, and the *East Sea*. The Greeks called it *Asphaltites*, from the sulphurous and bituminous matter which it casts upon its shores; and with which its waters are deeply impregnated. The appearance of this sea, and of the whole scenery about it, is dreary, desolate, and *death-like*. It varies in extent, according to the season of the year, from about 40 to 60 miles in length; and from about 10 to 15 miles in breadth.

[b] *Sea of Tiberias.*—This is a fresh water lake, about 16 miles long, and from six to nine broad.

of the sun, is also celebrated for its magnificent ruins, particularly for a temple of the sun. Its site is about forty miles south-west of Damascus.

About 120 miles north-north-east of Damascus, and 76 miles east-south-east of Iskenderoon or Scanderoon, stood Berœa, now *Aleppo*, a city of great wealth and importance when the trade of Europe and the East was carried on overland.

To the west of Damascus, in that part of Syria called Phœnicia, were the celebrated commercial cities of *Tyre* and *Sidon*; and farther to the south, *Joppa*, now *Jaffa*, where Jonah embarked for Tarshish, and at which Solomon imported the materials for the Temple.

On the Orontes, about twelve miles from the coast, was the rich and populous city of *Antioch*,[a] where the disciples of our Lord were first called CHRISTIANS: and near the mouth of the same river, the seaport, *Seleucia*,[a] from which St. Paul embarked for Cyprus in his first apostolic journey.

MESOPOTAMIA[b] was the name given to the tract of country *between the rivers* Euphrates and Tigris. The southern part of this country, near the junction of the rivers, was included in the ancient *Chaldæa* or *Babylonia*. In Mesopotamia was *Ur* of the Chaldees, from which Abraham was called to the land of Canaan, (the country between the river Jordan and the Mediterranean Sea). In the north-west of Mesopotamia was *Haran* or *Charræ*,[c] and *Edessa*.

ARMENIA,[d] which still retains its name, lies to the north of the ancient Mesopotamia. It consists principally of mountainous regions; and in it are the sources of the rivers Euphrates, Tigris, Cyrus or *Kur*, and Araxes or *Aras*. The chief towns were *Tigranocerta* and *Artaxata*. In Armenia is the celebrated Mount Ararat, on which Noah's Ark first rested.

COLCHIS, ALBANIA, and IBERIA, lay to the north of Armenia, between the Euxine and Caspian Sea. These countries, which are intersected by the Caucasian mountains, now include Georgia, Mingrelia, and part of Circassia.

At the mouth of the Phasis stood a city of the same name, the capital of Colchis, celebrated in fable for the expedition of Jason in search of the Golden Fleece.

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[a] There were several other cities called *Antioch* and *Seleucia*.

[b] *Mesopotamia*.—This term is derived from two Greek words which signify the *middle* or between the *rivers*. In like manner, the terms *Punjab* and *Doab* in Hindostan, signify, the one *between* the *five*, and the other *between* the *two rivers*. Compare also *Senegambia* (that is, between the *Senegal* and *Gambia*), in Africa; and *Entre Douro e Minho*, in Portugal.

[c] *Haran* is mentioned in Genesis xi. 31. It was here Crassus was defeated and slain by the Parthians. The Romans called it *Curæ*.

[d] *Armenia* took its name from *Aram*, the fifth son of Shem.

MEDIA lay to the south of the Caspian Sea, and north of Persia Its chief town was *Ecbatăna.*

PERSIA, which still retains its name, lay to the north of the Persian Gulf, and to the south of Media; but it was afterwards greatly extended. Its ancient name was *Elam*, from being first inhabited by the descendants of Elam, the eldest son of Shem. The chief towns were, *Persepŏlis*, *Susa*, and *Elymais.*

ARABIA still retains its ancient name and divisions, namely, Arabia *Deserta*, *Petræa*, and *Felix.*

In Arabia was the land of Uz, the country of Job; also Edom or Idumæa, the land of Midian, and Saba, the country of Sheba, the "Queen of the South."[a]

In the tongue of land between the northern branches of the Red Sea, were Mounts Sinai and Horeb; and at the top of the eastern branch stood *Ezion-Geber*, from which the ships of Solomon sailed to Ophir.[b] At the top of the western branch stood *Arsinŏe* or *Cleopatris*, now *Suez.*

ASIA MINOR consists of the great western projection of Asia between the Euxine or Black Sea on the north, the Mediterranean on the south, and the Ægean or Archipelago on the west. The term Asia Minor does not occur in classic writers, but was first applied in the middle ages.

The Romans divided this part of Asia into *Asia cis* or *intra Taurum*, and *Asia ultra* or *extra Taurum.*

DIVISIONS OF ASIA MINOR.

In the *north*—Pontus, Paphlagonia, and Bithynia.
In the *west*—Troas, Mysia, Æolis, Ionia, Lydia, and Caria.
In the *south*—Lycia, Pamphylia, Pisidia, Isauria, and Cilicia.
In the *east*—Cappadocia and Armenia Minor.
In the *middle*—Galatia, Phrygia, and Lycaonia.

The chief cities in Asia Minor were, *Ilium* or Troy in Troas; *Ephĕsus* in Ionia, celebrated for the temple of Diana, one of the Seven Wonders of the world;[c] *Smyrna*, also in Ionia, still a flourishing city; *Sardis* and *Philadelphia* in Lydia; *Halicarnassus* in Caria, where Herodŏtus the father of history was born, and Mausōlus[c] was buried,

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[a] *Saba* or *Sheba* was in the south-western extremity of Arabia Felix, which, in the time of our Saviour, was considered by the Jews as the most distant land to the southward; and hence she is described as coming from the *uttermost part of the earth.*

[b] *Ophir* is supposed to have been a port in *Sofala*, on the south-eastern coast of Africa.

[c] Hence the term *mausoleum*, which was first applied to his tomb. The five other Wonders were the Pyramids of Egypt; the Walls and Hanging Gardens of Babylon; the Labyrinth of Egypt; the Colossus of Rhodes; and the Statue of Jupiter Olympus at Athens, 75 feet high, sculptured by Phidias in ivory and gold.

whose *tomb* was another of the Seven Wonders of the world: *Cnidus*, also in Caria, in which was a celebrated statue of Venus, made by Praxitĕles; *Patăra* and *Xanthus* in Lycia; *Perga* in Pamphylia; *Tarsus* in Cilicia, the birth-place of St. Paul; *Issus*, also in Cilicia, where Alexander defeated Darīus; *Iconium*, *Derbe*, and *Lystra*, in Lycaonia, where St. Paul was stoned; *Gordium*[a] and *Laodicēa* in Phrygia; *Chalcēdon* in Bithynia, now called Scutări; *Nicæa*, now Nice, also in Bithynia, famous for the first general council held there in 325; *Sinōpĕ*, in Paphlagonia, the birth-place of Diogenes; *Trapezus*, now Trebizond, in Pontus; and *Cerăsus*, whence Lucullus is said to have first brought the *cherry*-tree into Italy.

Of the *northern* and *eastern* countries of Asia scarcely any thing was known by the ancients; the former the Romans called by the general name of *Scythia*, and the latter they divided into *India intra Gangem*, (within, or on this side the Ganges,) and *India extra* (beyond) *Gangem*.

AFRICA.

EGYPT, which still retains its ancient name, was a civilized and powerful nation even in the days of Abraham. It was first inhabited by Ham and his descendants; and hence it was called by the Jews *Mizraim*,[b] or the land of Ham.

The chief cities were—*Memphis*, which stood on the Nile, about a hundred miles from its month, near the locality of Grand Cairo, its present capital; *Thebes*, famous for its hundred gates, about two hundred miles farther up the river; and a little below Thebes, *Coptos*, once the great emporium of Arabian and Indian commerce.

Towards Ethiopia, nearly under the tropic of Cancer, was *Syēnĕ*; near the mouth of the eastern channel stood *Pelusium*, now Damietta; and at the mouth of the western channel *Canōpus*, now Rosetta. About fifteen miles to the west of Canōpus, between Lake Mareōtis and the island of Pharos, which was joined to the mainland by a mole or causeway nearly a mile long, stood the celebrated city of *Alexandria*; so called from its founder, Alexander the Great. It was subsequently called *Scanderoon*, but it has again resumed its ancient name.[c]

The other ancient divisions of Africa were Lybia, Ethiopia, Regio Syrtica, Africa Propria, Numidia, Mauritania, and Gætulia.

LYBIA lay to the west of Egypt, and extended along the coast as far as the Great Syrtis. In the north-west of Lybia was a noted city called *Cyrēnĕ*, whence the territory adjoining was called *Cyrenaica*, or "the country about Cyrene."

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[a] Where Alexander cut the famous Gordian knot, instead of untying it.

[b] *Mizraim*, a son of Ham.

[c] *Scanderoon* is a corruption of *Alexandria*.

ETHIOPIA lay to the south of Egypt along the Nile. It includes Abyssinia and Nubia.

REGIO SYRTICA lay between the *Syrtis Major* (Gulf of Sidra) and *Syrtis Minor* (Gulf of Cabes.) It was afterwards called Tripŏlis or Tripolitana, from its three principal cities.[a] It is now called Tripoli. See page 298.

AFRICA PROPRIA comprised the territory of the ancient and celebrated Carthage. Its other cities were Utica, Hadrumētum, Thapsus, and Tunis, which is about fifteen miles to the east of the site of the ancient Carthage.

The chief towns of Numidia were Cirta, Tabrăca, and Hippo Regius.

The chief towns of Mauritania were Cæsarēa and Tingis, now Tangier.

South of Mauritania lived the Gætūli, and Garymantes, of whose country little was known.

West of Gætulia were the *Insulæ Fortunatæ* or Fortunate Islands, one of which was called *Canaria*, from the number of large dogs (*canes*) found in it. They are now called the *Canary Isles.*

North of the Fortunate, were the *Insulæ Purpurariæ*, discovered by Juba, who there set up a manufacture of *purple.* They are now called the *Madeiras.*

EUROPE.

ANCIENT DIVISIONS OF EUROPE.

GRÆCIA or Greece, which, generally speaking, comprehended the Peloponnesus, Græcia Propria, Thessalia, and Epīrus.

ITALIA or Italy, the three principal divisions of which were Italia Propria in the middle; Magna Græcia in the south; and Gallia Cisalpina in the north.

HISPANIA or Spain, and LUSITANIA or Portugal. Spain was also called *Iberia*, and from its *western* situation, *Hesperia.*

GALLIA or Gaul was divided into *Gallia Cisalpina*, or the northern part of Italy; and Gallia *Transalpina*, or the modern France, Belgium, Switzerland, and part of Germany. Transalpine Gaul was divided into three parts, *Celtica*, *Belgica*, and *Aquitania.*

GERMANIA or Germany, which, generally speaking, included the country between the Rhine and the Vistula, the Danube, and the Baltic.

BATAVIA, now Holland or the Netherlands.

SCANDINAVIA, now Denmark, Sweden, Norway, Lapland, and Finland.

SARMATIA, which comprehended Russia, Poland, and part of Prussia.

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[a] Namely, *Septis*, *Œa*, and *Sabrata.*

DACIA, now Moldavia, Wallachia, and Transylvania.

MŒSIA, now Servia and Bulgaria.

THRACIA or Thrace, now a part of Roumelia.

ILLYRICUM, now Dalmatia, Bosnia, Croatia, and Sclavonia.

PANNONIA, now Hungary; NORICUM, now Austria; HELVETIA, now Switzerland; RHÆTIA and VINDELICIA, now the Tyrol and Country of the Grisons.

BRITANNIA,[a] or England; CALEDONIA, or Scotland; and HIBERNIA, or Ireland.

ISLANDS.—*Sicilia* or Sicily; *Sardinia; Creta*, now Candia; *Melĭta*, now Malta; *Baleāres* or Balearic Isles, now Majorca, Minorca, and Iviza; *Eubœa*, now Negropont, &c.

PENINSULAS.—Chersonesus *Cimbrica*, now Jutland; *Peloponnesus*, now the Morea; Chersonesus *Taurica*, now the Crimea.

SEAS.—*Mare Magnum* or *Internum*, now the Mediterranean; *Sinus Codānus*, now the Baltic; *Oceănus Cantabrĭcus*, now the Bay of Biscay; *Mare Ægæum*, now the Archipelago; *Pontus Euxinus*, now the Black Sea; *Palus Mæōtis*, now the Sea of Azof; *Propontis*, now the Sea of Marmŏra, &c.

RIVERS.—*Rha*, now the Volga; *Danubius* or *Ister*, the Danube; *Tanăis*, the Don; *Borysthĕnes*, the Dnieper; *Padus* or *Eridănus*, the Po; *Rhenus*, the Rhine; *Rhodănus*, the Rhone; *Albis*, the Elbe; *Ibĕrus*, the Ebro; *Liger* or *Ligĕris*, the Loire; *Sequăna*, the Seine; *Bœtis*, the Guadalquiver.

LAKES.—*Lemānus*, Geneva; *Brigantinus*, Constance.

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[a] When the Romans invaded Britain it was divided into a number of small independent states or tribes. The principal of these were the *Cantii*, inhabiting Kent; the *Trinobantes*, Middlesex; the *Belgæ*, Hampshire, Wiltshire, and Somersetshire; the *Durotriges*, Dorsetshire; the *Damnonii*, Devonshire and Cornwall; the *Silures*, South Wales; the *Ordovices*, North Wales; the *Iceni*, Essex, Suffolk, Norfolk, &c.; the *Brigantes*, Yorkshire, &c.

The Romans divided the country into two parts, *Romana* and *Barbara*, of different extent at different times, according to the progress of their conquests. Britannia Romana they further divided into *Prima*, *Secunda*, *Superior*, *Inferior*, &c.

The names of the principal rivers were, the *Tamesis* (Thames), *Sabrina* (Severn), *Abus* (Humber, &c.), *Vedra* (Wear), *Tina* (Tyne), *Ituna* (Eden), &c.

The principal islands were, *Vectis* (Wight), *Mona* (Anglesey), and *Mona* or Monæda (Man).

GENERAL RULES

FOR THE

PRONUNCIATION OF FOREIGN WORDS.

VOWELS AND DIPHTHONGS.

A.—In French, Italian, Spanish, and Portuguese words *a* has the sound of *ah* in English. In the German languages it has two sounds, a long and a short: the first is sounded like *a* in our word *half*, and the second has no corresponding sound in English.

AE *or* Ä.—In *German* words *ae* or *ä* has two sounds, a long and a short: the former is like the sound between *name* and *care*, and the short, nearly like *e* in *rent*.

AI *or* AY.—In *French* words *ai* has, generally speaking, the sound of *e*, as in our word *there*. In the *German* languages *ai* or *ay* sounds broader than the English *i* in *kite*; or as we pronounce *ai* in *aisle*.

AU *or* EAU.—In *French* words *au* and *eau* are pronounced like our long *ō*. Thus Hainault is pronounced *hainō*; and Bordeaux, *bordō*. In the *German* languages *au* approaches the sound of *ou* in our word *our*. Thus Breslau is pronounced *breslou*; and Austerlitz, *ousterlits*.

AEU *or* ÄU.—In *German* words *aeu* or *äu* has nearly the same sound as the diphthong *oi* in our word *toil*. Compare the German sound of *eu*.

E.—In *French* words *é* with the acute accent is sounded like our long *a*, as in *fate*; *è* with the grave, and *ê* with the circumflex accent, like *e* in *there*; and *e* not accented is generally pronounced like our open *e*, as in *met*. In *Italian* words *e* has either an open sound like *ai* in *fair*, or a close sound like the same diphthong in *pain*.

E *final*.—In *Italian* and most foreign words, *e final* is pronounced; but in *French* it is mute, unless marked with the acute accent (*é*).

EI.—In *French* words *ei* has the sound of *e*, as in our word *there*. In *German* words *ei* or *ey* has the sound of our long ī, as in *fine*.

EU, ĒU, ĔU.—In *German* words *eu* sounds like *oi* in our word *toil*. Compare the sound of *aeu* or *äu* in the same language. For the *ēu* or *ĕu* in French words, we have no corresponding sound, but it is something like the sound of *e* in *her*; or *u* in *fur*.

I.—In French, Italian, and most foreign words *i* has the sound of *ee* in English. But in some *French* and *German* words *i* has a short sound, as in our word *fig*.

IE *or* I.—In German words *ie* or *ī* has the sound of our long *e* or *ee*, as in *me* or *meet*.

O.—In most foreign languages *o* has, generally speaking, either a long sound, as in our word *robe*; or a short sound, as in *rob*.

OE *or* Ö.—In *German* words *oe* or *ö* has a long sound like the French *ēu*; or a short sound like the French *ĕu*. Our nearest sound to it is that of *e* in *her*, or *u* in *fur*.

OI.—In *French* words *oi* is sounded like the syllable *wa*, in *water*.

OU.—In French and most foreign words, *ou* is sounded like *oo* in English.

U.—In most foreign words *u*, generally speaking, is sounded as it is in our word *rule*. In French words *u* has a sound intermediate between the sounds of *oo* and *eu* in the same language, for which we

have no corresponding sound. Before *a*, *e*, and *i*, *u*, when taken in the same syllable, is pronounced like *w*; as in Guayaquil (gwī-a-keel), Cuença (kwensa), and Guardafui (gar-daf we). Compare the pronunciation of *u* before *a*, *e*, and *i*, in our words, *assuage*, *equal*, *quench*, *question*, *anguish*, &c.

UE *or* Ü.—In German words *ue* or *ü* is sounded like the French *u*.

UI *or* UY.—In *Dutch* words *ui* or *uy* sounds like *oi* in English.

W.—In *Welch* words *w* has the sound of *oo* in English. Thus, Amlwch is pronounced *amlook*; and Pwllheli, *poolheli*.

CONSONANTS.

CH.—Except in *French*, *Spanish*, and *Portuguese* words, *ch* is usually pronounced like *k*; as in Muni*ch*, Zuri*ch*, *Ch*erson, Mo*ch*a, *Ch*imborazo, &c. But in *French* and *Portuguese* words *ch* is pronounced like *sh*; as in *Ch*ampagne, *Ch*erbourg, *Ch*alons, &c.; and in *Spanish* words *ch* is pronounced like *ch* in our word *church*.

C, CC, CH.—In *Italian* words *c* before *e* or *i* is pronounced like *ch* in our words *cherry* and *chilly*; *cc* before *e* or *i*, like *tch* in our word *match*; but *ch* is pronounced like *k* in English; as in Civita Vecchia (*cheeveeta vekia*). In Spanish words, *c* before *e* and *i* sounds like *th* in our word *thin*. Thus Ciudad (that is, *city*) Rodrigo is pronounced *thoo-dat′ ro-dree′-go*. *Z* in Spanish words has a similar sound (*th* in *thin*).

CUA, CUE, CUI, CUO.—In Spanish words these syllables are pronounced *kwâ*, *kwey*, *kwee*, *kwo*.

G, J, X.—In French and Portuguese words, *g* before *e*, *i*, and *y*, and *j*, in all positions, are sounded like *zh* in English, or like *z* in the word *azure*. In Spanish words *g* before *e* and *i*, and *j* in all positions, are sounded like *h* strongly aspirated; as in the word *alcohol*. In several Spanish words *x* has the same sound, that is, the *guttural* sound of *h*; as in the Spanish pronunciation of the word Don *Quixote* (*kee-ho′-tĕ*.) In German and in several other languages, *j* is sounded like *y* in English; as in the word *hallelujah*.

GL, GN.—In Italian words *gli* has the liquid sound of *lli*, as in *million*, *seraglio*. In *French* and *Italian* words *gn* is pronounced something like *ni* in our words *onion*, *minion*. In *Spanish* *ñ* has a similar sound; and so, also, *nh* in *Portuguese*.

GH, GIA, GIO, GIU.—In Italian words *gh* has the hard sound of *g*, as in *go*; and *gia*, *gio*, *giu*, are pronounced like *ja*, *jo*, *joo*.

SCH.—In *German* words *sch* is, generally speaking, pronounced like *sh*. In Italian words *sch* is pronounced *sk*.

V, F, W.—In *German* words *v* is pronounced like *f*; and *w* like *v*. But the *w* in final *ow* is always silent.

TH.—In most foreign languages the digraph *th* has the sound of *t*.

S, T, D, X.—In *French* words the consonants *s*, *t*, *d*, *x*, are not pronounced when ending a word. But *Paris*, *Brest*, *Rheims*, *Arras*, and a few others are pronounced by us as if they were English words.

Z *or* ZZ.—In *Italian* and *German* words, *z* or *zz*, is pronounced like *ts* or *ds* in English.

In the names of places in India, and in the East generally, the accent is usually on the last syllable; as in Hindostan′, Affghanistan′, Hyderabad′, Seringapatam′, Serampore′, Ispahan′, Teheran′.

When the learner is in doubt about the pronunciation of a foreign word, the best way is to pronounce it as if it were English.

INTRODUCTION TO GEOLOGY.

To a complete knowledge of Geography, some acquaintance with the science of *Geology* is necessary. We shall, therefore, in addition to what has been said on this subject in the chapter on *Mountains* (page 67), give a short sketch of its leading principles.

GEOLOGY is that science which treats of the internal *structure* of the earth, and of the various *materials* of which it is composed. But how, it may be asked, can we know any thing of the internal structure of the earth? It is, as we have seen, an opaque and solid globe; and from the surface of it on which we stand, to the centre, is nearly 4,000 miles. Compared with this distance, the deepest excavations we can make in it are mere scrapings at the surface.

But even if we could penetrate to the centre, and make ourselves acquainted with the nature and arrangement of all the materials in that particular direction, it is obvious, that from such a result, no general conclusions could be drawn. Such must be our first thoughts on the subject, and such were the opinions, even of learned men, till Geology began to be studied as a science.

EARTHS.

At first view, the materials at or near the surface of the earth seem to be without arrangement or design; but on examination, we shall find that this is not the case. On, and immediately below the surface, will be found, generally speaking, loose or unconsolidated materials, which are called EARTHS; and from a due admixture of those earths is formed the SOIL of our gardens and our fields. The first in order is called *vegetable mould*, because it is composed principally of decayed vegetable and animal substances; and it is obvious that if this material had not been deposited at the surface of the earth, there could have been no vegetation, and consequently no support for animal life. The other earths are principally composed of particles which have been *disintegrated* or worn away from the various rocks which form the crust of the earth; and hence they have been called *mineral* earths. The *disintegration*, or crumbling away of solid rocks is occasioned by their long exposure to the influence of the atmosphere,[a] and to the continued action of the rain and the winds. Each of these earths is distinguished by the name of the mineral which

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[a] *Metals* are subject to similar influences. When iron, for example, is exposed to air and damp, its surface, however well polished, is soon covered or converted into reddish particles called *rust*. These particles gradually fall off, and others succeed, till the whole is, in the course of time, converted into a kind of reddish earth called the *oxide of iron*.

But the wear and tear of solid rocks is not confined to the particles

enters most largely into its composition; and each of them is found to be subservient to the wants and convenience of man.[a]

Thus, when earths are composed principally of SILEX or *flint*, they are called *Siliceous;* when of CALX or *limestone*, *Calcareous;* and when of ARGILLA or *clay*, *Argillaceous.* The term *alumina* is sometimes used instead of *argilla.*

If we had only the earth of *silex*, there could be no vegetation, for it is too *porous* to retain the necessary moisture. Of this, the sandy deserts of Africa and Asia are striking examples. But when siliceous earth is duly mixed with other soils, it improves them, and thus promotes vegetation. *Sand* mixed with *clayey* soil, for example, will correct its *stiffness;* and in this way, the moisture necessary for vegetation will be enabled to penetrate or filter through it. Similar observations might be made with regard to *calcareous* and *argillaceous* earths: the former is too dry and too hot for vegetation, the latter is too wet and too cold; but when mingled together in due proportions, they correct and improve each other, and thus contribute to the general fertility of the soil. It is with this view that the farmer mixes *lime* with his cold *clayey* soils.

But though *clay*, without a due admixture of other earths, is unfit for vegetation, because it will not allow water to penetrate or filter through it, yet it is to this very quality that we owe one of the necessaries, and, it might be added, one of the luxuries of life—we mean pure spring water. In page 67 we have briefly explained the origin and formation of *Springs*, *Brooks*, and *Rivers;* and we

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on the surface. The same influences from time to time cause large fragments to fall off; and it is of fragments so detached that the *gravel*, *pebbles*, and large *rounded* stones which are found on the sea shore and in the beds of rivers are formed. At first, they are rough and angular, but when subjected to the rolling of the waves on the sea shore, or to the action of running water in rivers, they, by grinding and rubbing against each other, gradually become smooth and rounded. The *rocky* beds over which they are carried or rolled, contribute to the effect produced.

[a] Without *sand* or *flint*, we could have no *glass* for our windows, nor for any other of the useful and important purposes for which this mineral is essential—from the common black bottle in daily use to the telescope in the hands of the astronomer. Nor could we even have *houses* without sand—at least houses built of *stone* or *brick;* for sand is a necessary ingredient in mortar; and also in the manufacture of bricks.

Similar observations might be made with regard to the various and important uses of *lime* and *clay.* The utility and necessity of the former to the mason, the farmer, the tanner, the soap-manufacturer, and the sugar-refiner, are well known; and without clay there could be neither bricks, nor slates, nor any of the beautiful and useful productions of our potteries, from the finest porcelain to the coarsest earthenware. The uses of lime and clay in the *Plastic* arts, and for many other purposes, are also well known.

have only to add, that but for the *retentive* quality of clay, there could be no great reservoirs of water under the earth, and, consequently, no springs. "The water which falls in rain" would continue its downward progress, "through the pores and fissures of the mountains," and never again return to refresh and fertilize the earth, did it not, sooner or later, meet with beds or rocks of clay, which, in effect say to it, "Thus far shalt thou go, and no farther."[a] It is, then, as we have already explained, collected in great natural cavities or reservoirs, and returned again to the earth in the form of springs, brooks, and rivers.

ROCKS.

In digging through the different earths which lie at or near the surface, we come to hard or consolidated materials which are called ROCKS. These rocks form what is called the CRUST of the earth; and, generally speaking, they are of the same materials as the earths which we have just described; the only difference being, that, in the earths, the materials are loose or unconsolidated, and in the rocks hard or consolidated.

This is the popular distinction between earths and rocks, but it should be noted, that in the language of *Geology*, the term *rock* is applied to every kind of earth, even to *peat*, as well as to stones, and masses of stone. The following table exhibits the four great classes of *earths* and *rocks*, with the different degrees of consolidation. It also illustrates the general principle, that *lower* rocks or strata are *harder* or more consolidated than those which are above them, because they have been subjected to a greater pressure.

Siliceous.	*Argillaceous.*	*Calcareous.*	*Carboniferous.*
Sand,	Alluvial Clay,	Marl,	Peat,
Sandstone,	Laminated Clay,	Chalk,	Lignite,
Graywacké,	Slaty Shale,	Limestone,	Brown Coal,
Quartz Rock.	Clay Slate.	Crystalline Marble.	Common Coal.

As in the earths, some rocks are formed of only one simple mineral,[b] as flint, limestone, and clay-slates; while others are composed of two, or more, as mica-slate and granite. The former are called *simple*, and the latter *compound* rocks. As in the earths, too, the most abundant materials of rocks are the simple minerals just

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[a] A knowledge of this fact leads us to line or form with clay the bottoms and sides of artificial reservoirs for water; as ponds and basins.

[b] By *simple* minerals are here meant individual mineral substances, as distinguished from rocks of which they are the constituent parts. They are not simple in their own nature, for when subjected to chemical analysis, they are found to consist of a variety of different substances. The most common species of Felspar, for example, is composed of about 64 per cent. of silica, 18 of alumina, 14 of potash, 2 of lime, and nearly 1 of oxide of iron. There are, according to the deductions of chemistry, no less than *fifty-four* simple or elementary substances.

mentioned, namely, flint, lime, and clay.[a] The other simple minerals which enter most frequently into the composition of rocks, are felspar, mica, hornblende, talc, chlorite, and oxide of iron.

Felspar is a hard mineral, usually of a cloudy white or red colour, which decays easily, and forms the fine clay used for porcelain. The soft, greyish crystals of granite, which can be easily scratched, are formed of felspar.

Mica is derived from a Latin word which signifies to *shine* or glitter. The bright glistening scales which we observe in granite, gneiss, and *mica*-slate, are formed of this mineral. It also occurs in minute scales in many sandstones; giving to them a bright silvery appearance. *Muscovy glass* is a variety of mica. It is often found in veins of granite and mica-slate, in *laminæ*, or thin plates, of more than a yard in diameter; and in Russia it is sometimes used instead of glass.

Hornblende is a hard mineral of a black or dark-green colour. It enters largely into the composition of several varieties of the *trap* rocks. When it occurs in granite instead of mica, granite is then called *syenite.*[b]

Talc is a transparent, foliated mineral, resembling mica, but softer, and not elastic. It is often used for tracing lines on wood, cloth, &c., instead of chalk, which is more easily effaced.

Chlorite (from the Greek word *chloros*, green) is either of a crystallized or foliated structure. It enters largely into the composition of chlorite slate. *Green earth*, which enters into the composition of many trap rocks, is allied to chlorite.

Oxide of iron is another name for the *rust* of iron. See note [a], page 333. It is it that gives the reddish colour to many rocks and mineral waters.

Bituminous[c] and *Saline* minerals also enter into the composition of certain classes of rocks. The great COAL masses are composed principally of the former, and ROCK-SALT of the latter. It is almost unnecessary to observe, that these two minerals are of the utmost im-

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[a] It is supposed that these minerals enter into the composition of the crust of the earth in nearly the following proportions: silex one-half, clay one-sixth, and lime one-eighth. *Quartz* is silex in its purest form, and *kaolin* (of which porcelain is made) is the purest kind of clay. Lime is never found by itself, that is, without an admixture of something else. It has a great affinity for carbonic acid, and united with it, it forms carbonates of lime, or, as they are usually called, limestones. *Quick*, or pure lime is obtained by driving off the carbonic acid and other volatile matter, as is done in lime-kilns. United with sulphuric acid, it forms sulphates of lime, as gypsum, alabaster, &c.; and with fluoric acid, fluates of lime, as fluor spar, &c. Shells and corals are formed principally of lime; and also, the greater part of the bones of animals.

[b] So called from *Syene*, an ancient city of Egypt, about which this species of rock is found in great abundance. It was largely imported by the Romans for architectural purposes.

[c] *Bitumen* is derived from the Greek word *pitus*, the pine tree, from the resin of which *pitch* is made. See note p. 318, for the different kinds and uses of bitumen.

portance to man, and hence they have been most abundantly diffused over the earth.[a] Refer to pp. 198, 214, and 316, in which the *Mineral Productions* of the earth have been classed and described.

Generally speaking, all the great rock masses in the earth are composed of one or more of the preceding simple minerals. But as they are usually blended together in different forms and proportions, the result is, that we have a great number and variety of rocks. The principal or most abundant rocks are mentioned in this little sketch; and before going farther, the learner should provide himself with a good specimen of each.

STRATIFIED ROCKS.

Having given a general description of the *materials* which enter into the composition of rocks, we shall resume our supposed examination of the CRUST of the earth. Passing through the EARTHS, and continuing our excavations, we, generally speaking, meet with different *strata*[b] or layers of rocks, one above another, in a certain determinate order, *which is never in any degree inverted*—that is, rocks of an older formation will never be found, in the order of stratification, above rocks which were formed at a more recent period;[c] or, in other words, *Primary* rocks will never be found above *Secondary* nor Secondary above *Tertiary;* and the same principle applies to each of the *strata* of the different groups or formations.

It is not to be supposed, however, that the stratified rocks always, or indeed, ever occur, in a regular and unbroken series. If this were so, the lower members of it would be beyond the reach, and beyond the knowledge of man. Some of them occur at, or near the surface in one place, and some in another; and in this way we have become acquainted with them all.

Generally speaking, the different strata are parallel to each other, and in a *horizontal*[d] direction; but in many places, we shall find that they have been broken up, distorted, and driven to, or near the surface, by rocks of a quite different character, which occur in *irregular masses.* The beneficial effect of this seeming irregularity has been stated in p. 68, to which the learner should refer.

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[a] *Rock-salt* sometimes forms entire mountains. The valley of Cardona, in Spain, for example, is traversed by hills of solid salt, 600 feet high, which glitter in the sun like mountains of gems. See p. 321.

[b] *Strata*, the plural of *stratum*, a Latin word which signifies strewed or spread; and also, a bed or layer.

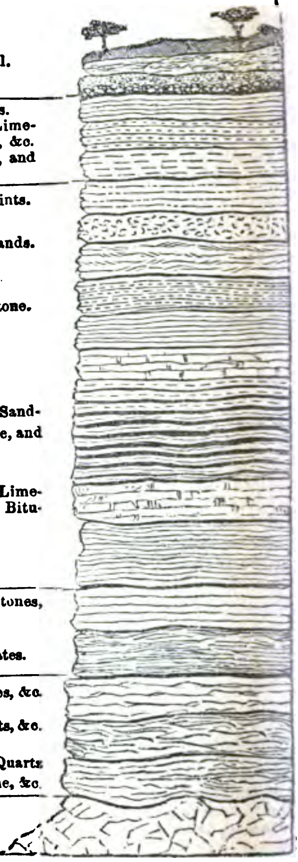
[c] This fact is of great practical importance to the miner; for if in searching for coal or any other mineral, he comes upon a stratum which, in its geological order, underlies the mineral he is in search of, he knows that further operations in that direction would be useless.

[d] *Horizontal.* Because they must have been originally deposited at the bottom of a sea or a lake, and consequently on a foundation which was *level*, or nearly so.

CRUST OF THE EARTH.

This Diagram represents the order of succession of the different Strata which form the Crust of the Earth. (See preceding page).

SUPERFICIAL ACCUMULATIONS.		Vegetable Soil. Alluvial Clay, Sand, and Gravel. Diluvial Clay with Boulders.
TERTIARY FORMATIONS.		Sandstone and Calcareous Grits. Estuary Marls, Imperfect Limestones, Gypsum, Sandy Clay, &c. Blue and Plastic Clays, Marls, and Lignite.
THE DIFFERENT SYSTEMS OF SECONDARY ROCKS.	*Chalk.*	Chalk Beds, with & without Flints. Green-sands and Gault.
	Oolitic.	Wealden Clay, Limestones, & Sands. Oolitic Limestones and Grits. Lias Limestone and Shales.
	Saliferous.	Saliferous Marls, Shell Limestone. New Red Sandstone. Magnesian Limestone.
	Carboniferous.	Coal Beds alternating with Sandstones, Clay-shale, Ironstone, and impure Limestones. Mountain or Carboniferous Limestone, Quartzose Sandstone, Bituminous Shales. Old Red Sandstone.
TRANSITION ROCKS.		Cambrian or Silurian Limestones, Micaceous Shales, &c. Grauwacké Rocks, Sandy Slates.
PRIMARY, OR METAMORPHIC ROCKS.		Clay Slates, Hornblende Slates, &c. Mica, Talc, and Chlorite Schists, &c. Gneiss Rocks, with beds of Quartz Rocks, Crystalline Limestone, &c.
Granite or Plutonic Rocks.		



In every part of the world in which similar examinations have been made, similar appearances have presented themselves; and hence the various rocks which compose the crust of the earth have been divided into two great classes, namely, STRATIFIED and UNSTRATIFIED. Sandstones, limestones, and clay-slates are examples of the former class of rocks; and granite, and trap rocks, of the latter.

The terms AQUEOUS and SEDIMENTARY are also applied to the Stratified rocks, because, as has been shown by geologists, they were originally formed by *sedimentary* depositions in *water*. And the Unstratified rocks are also called IGNEOUS and VOLCANIC, because it is supposed that they were originally formed by *fire* in the internal parts of the earth, and driven up from *below*, and *through* the stratified rocks by earthquakes and *volcanic* agency. From this circumstance they are also called ROCKS OF ERUPTION; as by Humboldt, in his "Cosmos."

If these conclusions and suppositions be true—and there can be no rational doubt of it—what astounding changes must have taken place in the earth before it was finally prepared for the abode of man! In countries far remote from the sea, and even on the summits of the highest mountains,[a] are found vast quantities of sea-shells, and other marine deposits, which is a proof that they were at one period submerged under the waters of the ocean. And in many cases, it appears that "the dry land" and "the waters" must have changed places repeatedly; and for long periods of time.[b] The whole series of *stratified* rocks, even those which are now buried thousands of feet deep in the earth, must have been formed, *one after another*, in this way.[c] That is, each stratum, in succession, must at one period or another, have been formed, either at the bottom of a sea, or of a fresh-water lake into which large rivers disembogued.

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[a] The sides of the banks of rivers which flow through hilly countries, or through deep ravines, often exhibit extensive and satisfactory specimens of stratified rocks in their natural order of superposition. Similar specimens may also occasionally be seen on high headlands or cliffs, adjoining the sea shore.

[b] Fossil shells, of forms such as now abound in the sea, are met with far inland, both near the surface, and at all depths below it, as far as the miner can penetrate. They occur at all heights above the level of the ocean, having been observed at an elevation of from 8,000 to 9,000 feet in the Alps and Pyrenees more than 13,000 feet high in the Andes, and above 15,000 feet in the Himalayas.—*Lyell.*

[c] During the process of deposition, each separate layer was once the uppermost, and covered immediately by the water, in which aquatic animals lived. Each stratum, in fact, however far it may now lie beneath the surface, was once in the state of loose sand or soft mud at the bottom of the sea, in which shells, and other bodies, easily become enveloped.—*Lyell.*

PRIMARY ROCKS.

When the waters of the great deep first swept over the earth, neither animals nor vegetables existed, and consequently in the strata then formed, there are no traces of organized matter. These strata are lowest down in the series, and the term *Primary* has been applied to them, because it is supposed that they were formed previous to the existence of animals and vegetables; and also previous to the formation of the other rocks. The latter supposition is founded on the fact, that in rocks of this class no fragments of any other rock have been found.

The Primary rocks are distinguished by their *slaty* and *crystalline*[a] structure. They are also very hard and *compact*,[b] and as has been already stated, quite destitute of organic remains. The principal rocks of this class are gneiss rocks, mica, talc, and chlorite schists,[c] quartz rock, crystalline limestone, and clay slates.

The Primary rocks overlie the granite or *igneous* rocks; and it is supposed that they owe their *crystalline* texture to their having come into contact with them when they were in a high state of temperature. It is also supposed that they originally contained some organic remains, and embedded fragments of other rocks; but that all traces of them were obliterated by the intense heat to which they were subjected. In this way, dark limestones, replete with shells and corals, have been turned into white statuary marble; and hard clays into mica and hornblende schists. Sir C. Lyell proposes that these rocks should be called *Metamorphic*; and he shows clearly[d] that the

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[a] *Crystal.* "Simple minerals are frequently found in regular forms with facets like the drops of cut glass of chandeliers. Quartz being often met with in rocks in such forms, and beautifully transparent, like *ice*, was called *rock crystal;* the word in Greek properly signifying a piece of *ice*. Hence the regular forms of other minerals are called crystals, whether they be clear or opaque. By *crystalline* is meant the internal texture which regular crystals exhibit when broken, or a confused assemblage of ill-defined crystals. Loaf-sugar and statuary marble have a *crystalline* texture. Sugar-candy and calcareous spar are *crystallized*."—*Lyell.*

[b] *Compact.*—That is, the grains or particles of which they are formed are so minute as not to be distinguished by the naked eye. *Granular* is the opposite of compact; and hence the terms *granite* and *granitic*.

[c] *Schists.* This term is applied to rocks easily split up into *slaty*-like plates or divisions. It is derived from the Greek word *schisma*, a splitting up, or division.

[d] When it was thought, as formerly, that all rocks were of aqueous formation, granite, as being the lowest, was naturally considered as having been the first formed; and it was therefore denominated "Primitive" or "Primary." But after "the Neptunian theory" had been abandoned, and the *igneous* origin of granite admitted, the terms in the sense in which they had been applied, became objectionable, and in many cases, erroneous; for instead of forming the oldest part of the

term "Primary" as applied to them is erroneous; but as his theory has not yet been fully adopted, we retain, for the present, the old terms, "Primary," "Transition," &c.

TRANSITION ROCKS.

After the formation of the Primary Rocks an important change began to take place in the world; for in the strata next formed, are found a few fossil remains of *zoophytes*, and *marine* shells, which is a proof that, at this period, animal life had commenced in the waters of the ocean. To this class of rocks the term *Transition*[a] has been applied, because they were considered by the older geologists as forming a *transition* or passage from the Primary rocks, which contain no fossil remains of any kind, to the Secondary rocks, which contain numerous fossils, not only of sea, but also of *land* plants and animals.

The Transition rocks, as has been already stated, contain only a few marine fossils, and they are all of the lowest class or order, as zoophytes, corals, and shells. They consist principally of thick beds of sandstones, shales, slates, and limestones, and are usually called Greywacké,[b] Cambrian, or Silurian rocks.

SECONDARY ROCKS.

Under the name of *Secondary* rocks are comprised all the formations, systems, and groups, from the Transition to the Tertiary rocks.

The term *Formation* is applied to rocks which seem to have been formed under nearly similar circumstances; and the term *System*, to rocks which are found to have nearly the same mineral and fossil character. Under one formation there may be several systems; and under one system, several *groups*.

Geologists have not yet agreed upon[c] an exact classification of the

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earth's crust in all cases, as had been formerly supposed, some granites are of comparatively recent formation—in fact, newer than the stratified rocks which they have disrupted, and in some cases, rendered crystalline. Or, in the words of Sir C. Lyell, "Some granites and granitic schists are of an origin posterior to many secondary rocks. In other words, some *primary* formations can be shown to be newer than many *secondary* groups—a manifest contradiction in terms."

[a] *Transition.* This term was applied to rocks of this class by Werner, the great German geologist, on the supposition that they formed a step or transition from the primitive state of the globe to that condition of it in which it began to be inhabited by living bodies.

[b] Or *Grauwacké*, which, in the language of German miners, signifies *grey rock;* many of the rocks of this class being of a grey colour. These rocks abound in some parts of Wales, and in Shropshire, the country of the ancient *Silures;* and hence the terms *Cambrian* and *Silurian*.

[c] The fossiliferous strata have been variously grouped according to the comparative value which different geologists have attached to different characters; some having been guided chiefly by the thickness, geographical extent, and mineralogical composition of particular sets

Secondary rocks. They are usually, however, divided into four great systems, each of which contains several groups or sub-divisions: 1. Carboniferous; 2. Saliferous; 3. Oolitic; 4. Cretaceous or Chalk.

Under the *Carboniferous* system may be grouped, beginning with the lowest, Old Red Sandstone, Mountain Limestone, and the Coal Measures; under the *Saliferous*[a] System, Magnesian Limestone, New Red Sandstone, and Saliferous Marls; under the *Oolitic*[b] System, Lias[c] Limestones, Oolitic Limestones, and Wealden Clay; and under the *Cretaceous* System, Lower Greensand, Gault, Upper Greensand, and Chalk.

In ascending this great series of rocks the *fossils* become more numerous, and of a higher order; but as in the Transition rocks, they all belong to extinct species of animals and plants. In the Old Red Sandstone, or lowest rocks of the series, are found, in addition to a greater number and variety of corals and marine shells, the fossil remains of peculiarly formed *fishes*. This proves that, at this period, the formation of *vertebrated* animals had commenced in the waters of the ocean. In the Mountain Limestone, corals and marine shells are very numerous; and in the coal strata we find for the first time, the fossil remains of *land* plants, *fresh-water* shells, and fishes of the *sauroid* family; that is, half fish, half reptile.

Long before the Coal formations, large portions of the surface of the earth had become dry land; and the vegetation which covered it, must have been of the most luxuriant kind. All the *coal* and *peat* which are found in so many parts of the earth, and in such abundance, were formed from the immense forests and gigantic plants which flourished at that period. Nearly 500 distinct species of plants and trees have been discovered in the coal strata, the majority of which resemble gigantic ferns, canes, and bamboos. Some of these *tree* ferns, as they are called, must have been between forty and fifty feet high; and their trunks vary from half-a-foot to five feet in diameter.

Of the vegetable origin of coal there can be no doubt. When slices of it, thin enough to admit the light, are minutely examined, its vegetable structure is distinctly perceptible; and it is not unusual to find, in coal beds, the trunks of trees half converted into coal.

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of strata; others by their organic remains. All, however, seem now agreed that it is by a combination of these characters that we must endeavour to decide which sets of strata should be entitled to rank as principal and independent groups.—*Lyell.*

[a] *Saliferous.* That is, *salt bearing* or containing. It is in these formations or groups that *salt* is principally found. See p. 321.

[b] *Oolite.* The term *oolite* is derived from the Greek *ōon*, an egg, and *lithos*, a stone; and it has been applied to this kind of limestone, because it consists of rounded particles like the roe or *eggs* of a fish.

[c] *Lias* is a provincial corruption of *layers*, in allusion to their regular stratification.

These wonderful and most important results were principally produced by the agency of *heat* and *pressure*. Or, in other words, to the deluges, earthquakes, and volcanoes, which overwhelmed, and buried in the earth, these *primeval* trees and plants, we owe the *coals* which we burn in our houses, our factories, and our steam-ships!

The *Oolitic* formations, from the Lias to the Wealden groups inclusive, are remarkable for the number and variety of the fossils which they contain; particularly of *sauroid*[a] animals. In these strata are found *saurians*, *ichthyosaurians*, and *plesiosaurians*,[b] in such numbers, and in such varieties, that this period in the world's history has been called the "age of reptiles." These creatures resembled gigantic *lizards* or crocodiles; and some of them were adapted for inhabiting the water; others for living upon land; and some were amphibious in their nature. Some of them, too, as the *pterodactyles*,[c] had wings, like bats, which enabled them to fly in the air! The *Wealden*[d] group is particularly remarkable for its fossils of gigantic *land* reptiles, including the *iguanadon*,[e] which was fully seventy feet in length. In this group, too, animals of the *mammalia* kind begin to make their appearance; but the only specimens yet found are of the *marsupial* order, and of small size: something like small kangaroos or opossums.

The *Chalk* formations are remarkable for the number and variety of their *marine* fossils; as corals, shells, fishes, and turtles. In some cases, chalk is almost wholly formed of minute shells and corals.

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[a] *Sauroid*. This term is derived from two Greek words which signify *like* or resembling a *lizard*. *Ichthyosaurus* means the *fish* lizard, and *plesiosaurus* implies that the creature was *nearer* or more like a lizard than a fish. To several other species of these creatures names have been given; as *megalosaurus*, the great saurus; *geosaurus*, the land saurus; *hylæosaurus*, the forest saurus; *teleosaurus*, the perfect saurus, &c.

[b] *Plesiosaurus*. This animal had the head of a lizard, the teeth of a crocodile, and the body of a serpent. Its neck was of enormous length, exceeding, in some of the species, that of the remainder of the body. It appears to have lived in shallow seas and estuaries; and while swimming it is supposed that it kept its neck arched like that of a swan, darting it down at the prey within reach. Prodigious numbers of their remains are found in the Lias group; and some of them must have been upwards of twenty feet long.

[c] *Pterodactyles*. From the Greek *pteron*, a wing, and *daktylos*, a finger. Eight species of flying-lizards have been discovered, of sizes varying from that of a snipe to that of a cormorant. The second digit of the fore-feet was of extraordinary length, with which it is supposed it partly supported its wings; and hence its name.

[d] *Wealden*. These formations are fully developed in the *wealds* or *wolds* of Kent and Sussex; and hence the term *Wealden*.

[e] *Iguanadon*. It had two rows of *teeth*, like the *iguana*; and hence its name.

TERTIARY ROCKS OR FORMATIONS.

The *Tertiary* rocks, or formations, comprise all those regularly stratified beds which occur above the Chalk system. They consist of marls, imperfect limestones, gypsum, sandstones loosely aggregated, lignite or half-formed coal, blue and plastic clays, &c. They were formerly considered as mere superficial accumulations, confined to certain localities; but when it was found that they consisted of regularly stratified beds, and that the organic remains which they contained could be referred to definite periods in the earth's history, they were classed as Tertiary rocks or formations. They are not of general occurrence like the other rocks, but are usually confined to *basins* near rivers and estuaries. And it is remarkable that the two great cities of London and Paris have been built on two such basins, that is, basins full of Tertiary formations. Hence the terms *London clay*, and *Plaster of Paris.*

The Tertiary formations have been divided by Sir C. Lyell into the Eocene, the Miocene,[a] and the Pliocene,[b] groups or periods. The term *Eocene* is derived from the Greek word *eôs*, the dawn, and *kainos*, new or recent; and it has been applied to the oldest groups of the Tertiary formations, because it is in these groups that the remains of animals of the same species as those which now exist, make their *first* appearance. For, as has been already stated, all the organic remains found in formations preceding the Tertiary, belong to species of animals which had disappeared from the earth before it was finally prepared for the reception of man. In the Eocene strata, the proportion of existing to extinct species of animals is about 3½ per cent.; in the Miocene, or *less* recent, 17; in the Older Pliocene or *more* recent, from 35 to 50; and in the Newer Pliocene, from 90 to 95.

The strata of the London and Paris basins are Eocene deposits. Deshayes enumerates 1,238 species of fossil shells as belonging to the Eocene group, only 42 of which have been identified with species now existing. And of forty species of Pachydermatous quadrupeds which existed at that period, some of which equalled the horse, and others the rhinoceros, in size, there are only four living representatives, namely, the daman of the Cape, and three species of the tapir. Of these ancient animals the *palæotherium*[c] was the most remarkable; ten or eleven distinct species of which have been discovered in the gypsum beds of Paris.

It is also remarkable that the organic remains found in the deposits of this period prove that the temperature in these latitudes was widely different from what it is at the present day. In the Eocene deposits in England and France, for example, are found the remains of animals and vegetables, which indicate that these countries then enjoyed a tropical climate. In the Paris basin, mastodons, elephants, rhinoceroses, hippopotami, crocodiles, and turtles have been discovered; and

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[a] *Miocene* is from the Greek *meion*, less, and *kainos*, new or recent.

[b] *Pliocene* is from the Greek *pleion*, more, and *kainos*, recent.

[c] *Palæotherium*, from the Greek words *palaios*, ancient, and *therion*, a wild beast.

in the London clay, more than one species of monkey, and several species of the palm tree. And in gravelly deposits on the banks of the Thames, tusks and other remains of the mammoth,[a] mastodon,[b] and other tropical animals, have been found. The beds of lignite also indicate a tropical luxuriance of vegetation; and it is worthy of remark, that such vegetation was necessary for the support of the huge graminivorous animals that then replenished the earth.

Miocene deposits are not known to exist in England; but they are met with in France and other countries in Europe. The *dinotherium*[c] was the most remarkable of the extinct species of quadrupeds which belonged to that period. It seems to have been the largest of all terrestrial animals; its head measuring four feet long and three broad, with immense tusks bent downwards. It is supposed to have been a herbaceous animal, of aquatic habits, and in construction it resembled the living tapir. Its gigantic remains have been found in great abundance at Epplesheim, in Hesse-Darmstadt.

Pliocene deposits are met with in various parts of Great Britain and Ireland; as in Cornwall, and near the estuaries of the Forth, the Clyde, and the Shannon. The *Norfolk crag*, and the red or *coralline crag*, met with in Suffolk, are Pliocene formations of the Older period.

Having given a general description of the *Stratified* rocks, from the lowest in the series to the highest, we shall return to the other great class, of which we spoke in page 339, namely, the

UNSTRATIFIED OR IGNEOUS ROCKS.

The *Unstratified* or *Igneous* rocks are usually divided into three classes: Granitic, Trap, and Volcanic.

The *Granitic* are the most abundant of all rocks. They extend to the greatest depths yet penetrated by man; and while they seem everywhere to form the foundation on which the other rocks rest, they are frequently found, not only at the surface, but in many cases far above it; for most of the hills and mountains in the world are composed of granitic rocks. They are also called *Plutonic* rocks, because it is supposed that they were formed by the agency of *fire* in the interior of the earth, and upheaved from it in a fluid, or semi-fluid state, like *lava* from a volcano. Like lava, too, they frequently

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[a] *Mammoth.* The primitive, and largest species of elephant. It is now extinct, but its fossil bones are met with in various countries; and in the year 1803, a whole carcass of one was found embedded in ice, near the mouth of the Lena, in which it must have lain for thousands of years! In the same locality, the bones of mammoths are so abundant that a Russian naturalist has stated it as his belief, that the number of elephants now living on the globe, must be greatly inferior to those which occur in a fossil state in those parts of Siberia.

[b] *Mastodon.* An extinct species of proboscal animal allied to the elephant. Its teeth had their surface covered with conical mamillary crests; and hence its name: from the Greek *mastos*, a pap, and *odous*, (*odontos*) a tooth.

[c] *Dinotherium.* From the Greek words *deinos*, terrible, and *therion*, a wild beast.

penetrate the rocks with which they come into contact, in the form of *dikes* and *veins*, altering their texture and original appearance (see page 341). The granitic rocks are easily distinguished by their *granular* and crystalline texture, and also by their hardness and massy appearance. Their great hardness is owing to their having cooled slowly under enormous pressure, namely, that of the superincumbent or overlying rocks.

Granite makes a beautiful and durable building stone; and it is much used in the construction of piers, harbours, bridges, and roads.

Besides the common granite, there are several varieties, as syenite, porphyrite, protigine or talcose, schorl, primitive greenstone, serpentine, &c.

The *Trap* rocks are of a darker and less crystalline texture than the granitic, and are supposed to be the products of volcanoes long since extinct. It is also supposed that they were once in a state of fusion, like the granitic rocks, and that they were cooled down under the pressure of deep water, probably of a profound ocean. They derive their name from the Swedish word *trappa*, a stair; because many of the rocks of this class occur in great tabular masses of unequal extent, so as to form a succession of terraces or steps on the sides of hills. They also occur in shapeless lumps and irregular cones, forming small chains of hills; and, frequently, in the form of dikes or wall-like masses, intersecting fossiliferous beds. Occasionally, too, they are found in the form of columns or pillars, which are usually called *basaltic columns*. The Giant's Causeway, in the North of Ireland, and Fingal's Cave, in the Isle of Staffa,[a] contain wonderful examples of formations of this kind.

Basalt[b] is one of the most abundant rocks of this class. The other varieties are greenstone, clinkstone,[c] claystone, trachyte,[d] porphyry,[e] and amygdaloid.[f]

The *Volcanic* rocks, as the name implies, are the products of re-

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[a] *Staffa.*—This island evidently owes its name to the *staff*-like form of the columns.

[b] *Basalt* is derived from *basal*, an Ethiopian word, signifying iron. These rocks often contain much iron.

[c] *Clinkstone* owes its name to the metallic or ringing sound which it emits when struck with a hammer.

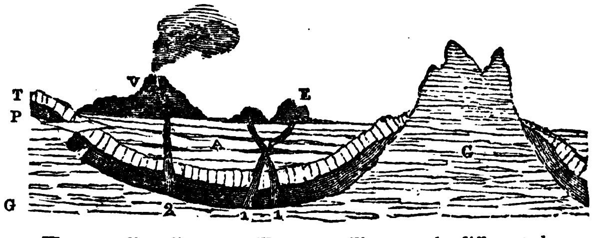
[d] *Trachyte* is derived from a Greek word, which signifies *rough*. This rock has a peculiarly *rough* feel.

[e] *Porphyry* is from a Greek word signifying *purple*. It was originally applied to a *reddish* rock found in Egypt, and used by the ancients for statuary purposes; but it is now extended to all igneous rocks, whatever their colour, which contain embedded crystals of felspar, or any other mineral distinct from their mass. Such rocks are called *porphyritic*.

[f] *Amygdaloid*, from two Greek words, signifying *like* an *almond*. In such rocks, agates and simple minerals are scattered like almonds in a cake.

cent or active volcanoes. They are less crystalline, and less compact than either the granitic or trappean rocks, which is supposed to be owing to their having cooled in the open air, and not under pressure. The principal rocks of this class are lava, obsidian,[a] pumice-stone, scoriæ, and tufa.

In the "Chapter on Mountains," page 69, the names of the principal volcanoes at present in operation have been given, to which the learner should refer. It will be seen that they are as active amid the perpetual snows of the polar regions as under the scorching rays of the torrid zone. And though their eruptions are sometimes attended with the most calamitous results, it will be found that they are, upon the whole, beneficial in their uses. In fact, they may be regarded as great natural *safety-valves*, for preserving the districts of country in which they are placed, from the still more calamitous effects of EARTHQUAKES. One proof of this is, that, in volcanic regions, earthquakes have been known to cease the very moment that eruptions commenced from volcanoes in the same district. And occasionally, eruptions from volcanoes in districts comparatively remote, have had a similar effect: which also proves that in certain portions of the globe there must be vast subterranean cavities, communicating with each other to the extent of hundreds of miles. When we hear, therefore, of the terrific and destructive effects of volcanic eruptions, we may be very sure that the consequences would have been still more disastrous if the irresistible force which produced them had not spent itself in this way. In fact, if it had not found a vent through the craters of volcanoes, it would have broken up the crust of the earth, and, perhaps, swallowed up whole cities and districts.



The preceding diagram will serve to illustrate the different classes of rocks of which we have spoken. The lowest rock, which is represented by the letters G, G, is supposed to be *Granite*. Those lying next to it, (P, T,) which it has upheaved from their original hori-

[a] *Obsidian* is a glassy lava, of various colours, but usually black. It was so called from Obsidius, who first discovered it.

zontal position, and at the right, entirely broken through, are *Primary* and *Transition* rocks. The Primary, which is supposed to have been altered by the heat of the underlying granite, is also called *Metamorphic* (see page 341). A represents strata deposited above the primary and transition rocks after their upheaval. E, 1, volcanic matter breaking through all the strata in the form of *dikes*, and also spreading between them, and forming above large tabular masses and irregular cones, as at E. These are *Trap* rocks; and the volcanoes which ejected them are supposed to be extinct. V, 2, represents the erupted matter of an active volcano.

CONGLOMERATE ROCKS.

When rounded fragments of rocks, or pebbles, are cemented together by another mineral substance, so as to form a solid rock, the whole mass is called *Conglomerate*,[a] and sometimes *Pudding-stone*. When angular fragments are thus cemented, the term *Breccia*[b] is substituted. The substance cementing may be of a siliceous, calcareous, or argillaceous nature (see page 335).

SUPERFICIAL ACCUMULATIONS.

All loose and irregularly deposited materials at, or near the surface of the earth, are called *Superficial Accumulations*. They consist principally of masses of sand, gravel, clay, marls, animal and vegetable drift, debris, and boulders or *bowlders;* and are usually divided into *Diluvium*,[c] *Alluvium*, and *Soil*.

The diluvial deposits[d] contain large rounded stones called *boulders* or *erratic blocks;* and also the bones of large extinct animals, as the mammoth and mastodon, in places to which the forces of no water now in action, could have transported them.[e] It has therefore been supposed that they were carried to those places by the waters of the Deluge; and hence, to *drift* or deposits of this kind, the term *diluvial* has been applied.

Many of these boulders are from ten to twenty tons weight; and some of them must have been carried, not only from one part of a country to another, but also from continental countries to distant islands. In England, for example, are found boulders which must

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a *Conglomerate* is derived from two Latin words, which signify to gather into *a ball*.

b *Breccia* is from an Italian word, signifying *broken*. It is pronounced *bret'cha*.

c *Diluvium* in Latin signifies a *deluge*. It is derived from *luo* to wash, and *dis*, asunder. *Alluvium* is from the same root, and *ad*, to.

d Diluvial deposits are found containing the remains of animals now extinct at the height of 16,000 feet on the Himalaya Mountains, and 7,000 feet on the Andes. They also contain fragments of other rocks found only in distant countries, which nothing but such a violent convulsion could have transported.—*Buckland*.

e The transportation of boulders has been recently attributed to the agency of *glaciers* and *icebergs*. This theory has been advanced by Sir C. Lyell, and he has ably supported it by proofs and illustrations.

have come from the mountains of Norway; and immense blocks of Finland granite are scattered over the plains of Russia.

Boulders are usually of *granite* and other primitive rocks; and of all sizes from that of an egg to masses weighing several tons. They are either imbedded in clay, or scattered loosely over the surface.

Connected with the diluvial deposits should be mentioned the remarkable OSSIFEROUS, or bone-containing caverns, which have been found in all parts of the world, from the British Islands to Australia. In these ancient caves, mixed with deposits of mud or gravel, and usually covered over with calcareous incrustations, are found large accumulations of the bones of animals, many of which belong to species found only in other regions of the earth.

In Kirkdale cave, in Yorkshire, for example, were found the bones of elephants, rhinoceroses, hippopotami, tigers, hyænas, bears, and wolves, mingled with the bones of horses, deer, oxen, foxes, hares, rabbits, ravens, pigeons, ducks, &c. There are several similar caves in England; but this is the most remarkable one.

The ALLUVIAL deposits have been formed by the action of rivers, and other causes still in operation. The extent of the alluvions deposited at the mouths of rivers, and in the valleys which they periodically, or occasionally overflow, will enable us to form some idea of the vast amount of earthy, rocky, and vegetable matter which they carry with them in their course. It was a saying of the Egyptian priests, even before the time of Herodotus, that, "Egypt was the gift of the Nile;" and in fact, the whole of Lower Egypt, or, as it is usually called, the *Delta*, was formed by the alluvial matter carried down by its waters.

There are evidences to show that the base of the rocks on which the Pyramids of Memphis stand, was at some former period washed by the waters of the sea. These Pyramids are now about a hundred miles from the Mediterranean, and the ground at their base is 60 or 70 feet above the level of its waters.

Even within the historic period, the extension of the Delta of the Nile has been considerable;[a] and the changes which have taken place in it since it entered the sea by seven large mouths, are obvious and remarkable. Most of its ancient mouths have been filled up with alluvial matter; and rocks and islands which were formerly at some distance from them, as Canopus[b] and Pharos, are now connected with the mainland. The town of Damietta, too,

[a] *Delta.* Strictly speaking, the Delta comprised the large *triangular* tract of country between the western and eastern branches of the Nile, and the Mediterranean sea. The extension of the Delta has been checked of late years by powerful littoral currents, which carry off the new alluvions to other parts of the Mediterranean. See p. 188.

[b] *Canopus*, in the time of Scylax, the geographer, was an insular and desolate rock.

whose walls were formerly washed by the sea, is now some miles distant from it; and the same may be said of Rosetta.

Similar changes are known to have taken place in other parts of the Mediterranean. In the delta of the Rhone, Notre Dame des Ports, which was a harbour in 898, is now a league from the shore; and in 815, Psalmodi was an island, but it is now two leagues from the sea. And the watch-tower of Tignaux, which was erected on the verge of the sea in 1737, is already a French mile inland.

About the mouths of the Po and Adige similar changes have taken place. The town of Adria, for example, was a seaport in the time of Augustus; but it is now 14 miles distant from the sea on which it stood, and to which it gave its name. Ravenna, which was also a seaport, is now 5 miles inland.

In many other parts of the world the alluvions of rivers are even more extensive. The land at the mouth of the Mississippi has advanced 15 miles within the last century; and it has been calculated that the alluvial matter carried down annually by the waters of the Ganges would, if collected, and in a solid state, contain upwards of 6,000 millions of cubic feet.[a] This, according to Sir C. Lyell, would more than equal in weight, forty-two of the great Pyramids of Egypt,[b] supposing them to consist of solid masses of granite. Or, according to another computation, if a fleet of eighty Indiamen, each freighted with 1,400 tons weight of sand, were to sail down the river every hour of every day and night for four months continuously, they would only transfer from the higher country to the sea, a mass of solid matter equal to that borne down by the Ganges in the flood or rainy season.[c] During this season, which lasts for four months, the mud brought down by the river discolours the waters of the Bay of Bengal for 60 miles from the shore.[d]

When rivers flow into, or even pass through lakes, similar results are produced. For when a river enters a lake its velocity is checked; and the alluvial matter which was held in suspension by the motion of its waters, sinks by its own gravity, to the bottom; the heavier

[a] The delta of the Ganges is more than double that of the Nile; that part of it alone which is called the *Sunderbunds* being equal in extent to the whole principality of Wales. Its whole area is supposed to contain 44,000 square miles. The delta of the Niger is also very extensive, its area being estimated at 25,000 square miles, that is, nearly as large as the whole of Scotland.

[b] The base of the great pyramid covers thirteen and a half acres of ground, and its perpendicular height is 479 feet.

[c] Yet in addition to this, it is probable that the Brahmapootra conveys annually as much solid matter to the sea as the Ganges.—*Lyell.*

[d] It has been stated that the muddy waters of the Amazon may be distinguished during the rainy season for 300 miles from its mouth; and it is the alluvial matter brought down by the great Chinese rivers, the Hoang Ho, and the Kiang Ku, that not only colours, but is also gradually silting up, or shoaling the *Yellow Sea.*

substances first, as gravel; then sand; and ultimately the finest mud. In such cases, lakes are gradually silted up, and their beds or basins are ultimately changed into alluvial land.

The beautiful lake of Geneva, for example, is gradually going through this process. In the time of the Romans, Port Vallais stood on the margin of the lake, but it is now more than a mile and a-half inland. It is at this end of the lake the Rhone enters, and its waters on entering are turbid and discoloured; but on issuing from it at the other end, they are beautifully clear and transparent. The same process is going on in the great American lakes, particularly in Lake Erie, which, according to Sir C Lyell, is rapidly filling up.

Besides the constant formation of new land, at the mouths of rivers, by the influx and deposition of earthy matter, and the gradual silting up of lakes from the same causes, it often happens that large portions of the bed of the ocean are elevated by volcanic and subterraneous agency,[a] above the level of the water, and converted into dry land. In this way, from time to time, new islands are formed, and large additions made to the coasts of countries in various parts of the world. The labours of the coral insects, too, are constantly and wonderfully adding to the amount of the dry land; for the reefs and islands which they raise above the surface are, in process of time, converted into land fit for the abode of man.

We are not to conclude, however, that the relative proportions between the land and water on the earth's surface are undergoing any material alteration; on the contrary, we may suppose that, upon the whole, they continue much the same. What the land gains in one place, it loses in another; for ample and sometimes terrible reprisals are made by the ocean.[b] In fact, it is essential to the

[a] Sometimes these elevations are sudden and violent, and sometimes gradual and insensible. There are instances of mountains and islands having been thrown up in a few days, and even in one night, during earthquakes and volcanic eruptions; and in various parts of the world, it has been ascertained that extensive districts of country are gradually rising above their former level. The northern shores of the Baltic, for example, are gradually and slowly rising. Many places which a century ago were on the level of the sea, are now several feet above it. This has been fully proved by Sir C. Lyell.

It should be noted here, that the surface of the earth and the bottom of the sea are subject to *depressions* as well as *elevations*; and that they are produced by the same agencies, and in the same way—that is, sometimes suddenly and with violence, and sometimes slowly and imperceptibly.

[b] The very elevation of the bed of the sea often leads to the submergence of land; for if the adjoining coast be low, the displaced water will naturally flow over a portion of it. "*Submarine Forests*" may be accounted for in this way. It should be noted, however, that when there is an elevation of the bed of the sea, there may occur, at the same time, corresponding depression of it, and that in such a case the adjoining coast would not be submerged; and in fact, the sinking down of the bed of the sea is one of the means by which the submergence of land is prevented

habitable condition of the globe that their relative proportions should, upon the whole, remain undisturbed; and this, we see, has been provided for by the establishment of agencies which counteract and counterbalance each other. It is also essential to animal and vegetable life that there should be mountains and inequalities on the surface of the earth, and this has been assigned as the work of igneous and subterraneous agencies. For if the effects of aqueous and atmospheric agencies were not counteracted, the surface of the earth would, in process of time, be reduced to the level of the sea. "The war of elements," therefore, so far from having a destructive tendency, is, upon the whole, conservative in its effects.

"All nature is but art unknown to thee;
All chance, direction which thou canst not see;
All discord, harmony not understood;
All partial evil, universal good."

In the preceding sketch we have endeavoured to make the leading principles of Geology not only intelligible, but also interesting to young and inquiring minds; and we trust that we have to a certain extent succeeded. Even what we have written must show its great practical utility in connexion with mining, agriculture, engineering, architecture, and all the arts of life; and though the subject (as Burke has said of geography), is an earthly one, it is a heavenly study; for no science, not even astronomy, more strikingly displays "the work of an Almighty hand." In fact, at every advance which the student makes in this wonderful science, he will find fresh proofs of the power, the wisdom, the goodness, and the unceasing superintendence of the Creator.

*** Want of space has prevented us from pointing out the connexion between Geology and Physical Geography, which we had principally in view when we commenced this sketch. It will be obvious to the reader, however, that the Physical Geography of a country or district, will depend, in a great measure, on its Geological character. In primary districts for example, the mountains, generally speaking, will be high and abrupt, the surface rugged and broken, the soil scanty and unproductive, and the rivers, from rolling over rocks and precipices, unfit for navigation. In such districts, too, deep glens, and abrupt precipices, and picturesque waterfalls will be frequent.

Primary regions have also peculiar advantages. The springs of water are numerous and peculiarly pure, and the air is bracing, and, generally speaking, free from noxious exhalations. Such countries are, therefore, generally speaking, more healthy, and more favourable to human existence. It is also obvious that when primary countries are conterminous to the sea, they form bold and elevated coasts, with deep water, and harbours free from shoals.

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DUBLIN: Printed by ALEXANDER THOM, 87 & 88, Abbey-street.
